MINISTRY OF LANDS, AGRICULTURE, FISHERIES, WATER AND RURAL RESETTLEMENT





LIVESTOCK PRODUCTION MANUAL FOR FARMERS





2021

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THE MANUAL

This publication was developed specifically for all those who would want to become Master Farmers. It is going to serve as a reference point for all farmer categories in Zimbabwe. It is the Ministry's hope that farmers will use this manual and be able to improve on production and productivity thereby reversing the negative trends suffered by the Sector in the past 2 decades

Contents

BEEF CATTLE


Breeds

Types	Examples	Characteristics
Indigenous (*Bos indicus)*	Mashona Nguni (Nkone)  Tuli breed 	- Hardy and adapted to harsh local conditions. - Better disease resistance.
Exotic (*Bos Taurus*)	Hereford  Angus  Sussex  Simmental 	- Good hybrid vigour if crossed with indigenous. - Good milk producers (good for weaner production). - Good mature sizes.

Breeding Management

- Heifers for bulling should be selected on weight and conformation and should have achieved65 % of mature body mass, which is at18 -24 months of age.
- Bulling season: November to April.On calving, the cow will maximize on summer grazing and produce more milk for the calf.
- Heifers should be bulled 4-6 weeks earlier than cows, and preferably by young bulls.
- Gestation period ± 280 days (average).
- Bull ratios: In single sire herds 2½ - 4%. In multiple sire herds 4%, depending on system and standard of management.
- Pregnancy diagnosis:6-10 weeks after end of bulling season.

Special considerations for traditional or smallholder systems

The following are characteristics of these systems:

- Communal areas are generally overgrazed.
- Crop residues supply ± 50% of cattle feed.
- There is no fencing in most cases.
- Different farmers run their cattle together as one herd.
- Impossible for individual farmers to practice controlled breeding.
- Animals are usually sold when they are old.

Suggested management strategies to improve animal performance for smallholders

- Embark on selection and culling of stock.
- Cull poor quality bulls from the communal herds and purchase bulls of improved genetic merit. For communal areas, indigenous bulls should be given preference. This has to be organised at community level.
- In such systems bulling ratio should be around 2.5% as animals are running together throughout the year.

Calving

Management level	Calving (%)	Mortality %
Traditional/Small holder	55 - 60	3 - 25
Commercial	66 - 80	1 - 5

Calves

- Dehorn at 1-3 weeks.
- Castrate any time up to two weeks before weaning.
  - Burdizzo: from three months onwards.
  - Elastrator: use before calves are three days old.
  - Knife castration
- Weaning: at 6-8 months.

Cattle handling facilities

- Site Selection:-
  - Gently sloping ground with good drainage.
  - Water should be readily available.

Essential Facilities

Item	Requirements
Race 	10-12m long (V-shaped) 0.6-0.7m wide Smooth horizontal rails/poles
Holding pens 	2.5 m² per head
Forcing pens 	1.7 m² per head
Calf pens 	0.6m² per head
Sorting gates 	2m wide
Fences	Boundary: not less than 4 strands Internal: 3 strands or more Top strand not less than1.2 m from ground
Uprights	2.75m high (0.75 planting depth)

Loading ramp 	1.25m high on road side 6.25 m long Gradient of 1:5 0.6-0.7m wide race
Platform 	1.9-2.5 m wide 1.2m long
Feeding pens 	9m² per head
Feeding troughs 	300mm per head Can be fabricated from splitting 200litre drums 680mm above hoof level
Drinking troughs 	100mm trough length per head 680mm above hoof level 0.4 m² of water surface Can be fabricated from splitting 200litre drums

Grazing Management

- Carrying capacity of veld being grazed is based on agro-ecological regions and veld type.
- A general guide is given below based on natural regions:

Natural Region (Agro-ecological)	Carrying Capacity (ha/LU)
I	3
II	4
III	5
IV	8
V	12

***Note**: 1 Livestock Unit (L.U) is equivalent to 500kg*

Stocking rates should be managed to maximize production per head.

- Over grazing reduces grass re-growth and seed production.
- It is essential to rest the veld.
- Control bush encroachment to promote grass growth.

Pastures

- Pastures should be managed so that there is no contamination by toxic substances that may harm the animals or enter the food chain and become harmful to consumers.
- Avoid exposing animals to human excreta as this may lead to possible infection with *Taenia saginata* ending up developing beef measles, a zoonotic disease.

Supplementary Feeding

- Necessary in the dry season when feeding value of veld is low. Supplies extra protein and other nutrients that will improve performance of the animals.
- Supplementary feeding should start as soon as animals start losing weight
- Feeding should be prioritised for the following classes:
  i. In-calf heifers
  ii. Lactating 1st calvers
  iii. Cows in calf (second year)
  iv. Yearling heifers
  v. Yearling steers
  vi. Weaners
- In the smallholder sector, priority can also be given to draft power animals.

Supplements required

- Protein: needed in dry season.
- Energy: early summer season.
- Mineral (especially phosphorous): rainy season.
- Vitamin:mainly vitamin A during/after a drought.

Feed supplements forms

- Blocks
- Meals
- Cubes
- Protein/Urea/Salt Licks

General beef cattle management calendar

		Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Management													
	Breeding Herd												
	Calving: Heifers and Cows	■	■	■	■	■							
	Bulling:												
	Heifers			■	■	■							
	Cows			■	■	■	■	■	■				
	Pregnancy Diagnosis										■	■	
	Culling cows (on performance and age)										■	■	
	Select replacement heifers										■	■	
	Young Stock												
	Identify calves, dehorn at 1-3 weeks	■	■	■									
	Castration	■	■	■	■	■							
	Weaning calves (+/- 8 months)										■	■	

Nutrition	**Protein Supplementation (Adequate roughage essential)**												
	Lactating Heifers (500 g CP)												
	Lactating Cows (350 g CP)												
	Young Stock (150 g CP)												
	2nd calvers (225 g CP)												
	In calf cows (175 g CP)												
	Energy Supplementation: Crop residues + Hay												
	Phosphate/Salt Supplementation												
	Check for overstocking												
	Sample weightings to determine mass changes												

Pen-fattening

- This is done to:
  - increase extra mass to slaughter stock or
  - to increase degree of finish to achieve higher grades at a younger age.
- Commercial complete feeds are available.
- Farmer can produce home-mixed rations with advice from Extension staff, e.g. a mix of 12 snapcorn: 1 concentrate. Snapcorn consists of 78% grain, 10% cob and 12% sheath.
- When pen-feeding, it should be noted that young stock convert feed more efficiently than older stock (cull cows and old oxen).
- The feeding period for older animals should be between 60 and 90 days.
- Profitability is dependent on cost of animal, the cost of the feed and the feeding period. The fattening period should end when the unit value of carcass gain is equal to the cost of feed required to produce it.

General guide on fattening targets

Category	Begin live mass (kg)	Feed/animal/day (kg)	Days in pens	Total feed (tons)	End live mass (kg)
Heifers	260	11	90	0.99	386
Steers (1.5 yr)	280	11	90	0.99	420
Steers (2.5 yr)	350	12	90	1.08	485
Cull cows	400	14	75	1.05	470

Drought feeding

Due to the increasing frequency of droughts in this country, the following strategies can be adopted to minimize livestock losses:

- Early assessment of the situation and decision-making.
- Disposal of less productive stock and saving the money for re-stocking or to buy feed supplements.
- Wean calves early, even at three months old.
- Drought survival feeding (depending on the severity of the drought).
- Use of crop residues, conserved feed or purchased feed sparingly.
- Good internal and external parasite control.

General health management calendar

		Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
HEALTH	**Vaccinations**												
	Calves												
	Calf paratyphoid (at 3 weeks if it is a problem)												
	Rift Valley Fever (where endemic)												
	Rift Valley Fever Booster (in problem areas)												
	Anthrax, Quarter Evil at 3 months												
	Quarter Evil at 6 months												
	Contagious abortion S19 : Heifer calves at 4-10 months												
	Yearlings												
	Rift Valley Fever (where endemic)												
	Anthrax												
	Quarter Evil Booster at 18 months												
	Mature Stock												
	Colibacillosis (last 6 weeks of pregnancy if a problem)												
	Vibrio : -Heifers 6 weeks before service												
	-Bulls 8 weeks before service												
	-Cows 6 weeks before service												
	Rift Valley Fever (whereendemic)												
	Anthrax (not cows in advanced pregnancy)												
	Dosing/Deworming												
	Conical Fluke: Weaners and Yearlings												
	Liverfluke (all stock except calves in problem areas)												
	Roundworms (young stock after first good rains (40mm). Older stock if necessary)												
	Roundworms (prior to weaning)												
	Tick Control												
	Weekly dipping in rainy season when tick activity is highest												
	Dipping once fortnightly in dry season when tick activity is reduced.												
	In Theileriosis/January disease areas, weekly dipping in winter (to prevent build-up of brown ear tick larval and nymphal stages)												

Note:

- *The list above is not exhaustive so the Veterinary Officer in your area will help in advising what you should vaccinate against.*
- *All cloven-hoofed animals are susceptible to Foot and Mouth Disease. In the case of animals exhibiting foot sores and mouth sores report to veterinary authorities.*
- *In the event of a theileriosis outbreak, a 5-5-4-day dipping interval (dipped three times in 2 weeks) under the supervision of DVS must be enforced coupled with tick grease application before in between dipping sessions.*
- *In cases of evidence of inadequate tick-control in some or all animals after dipping, tick grease application in between dipping sessions recommended.*

Dosing for roundworms

- As a general rule, all stock should be dosed at the beginning and at the end of the rainy season(especially weaners and yearlings).
- It is recommended that dung samplesshould be analysed by the Veterinarian to determine whether suggested dosing programmesare inadequate or excessive.

Dipping

- Ticks spread many diseases to livestock.
- These tick-related diseases cause 75% of cattle deaths in Zimbabwe every year.
- Ticks are controlled through various dipping methods such as:
    i. Plunge dip,
    ii. Spray dip and
    i. Pour-on dip
- In the first two methods the animals are completely submerged in the plunge or wet thoroughly using a spraying appliance containing an effective tick-destroying agent at the concentration specified in the manufacturer's instructions.
- Pour-on is a concentrated oil based dip chemical containing a spreading agent which when applied topically allows the dip to spread over the skin of the animal.
- General dipping recommendations are that this should be done weekly during the rainy season and fortnightly in dry season. This is determined by the level of tick problems.

Spray race

Plunge dipping

Estimating Age of Cattle

Number of teeth	Approximate age teeth appear
2 tooth	18-26 months
4 tooth	24-33 months
6 tooth	30-41 months
Full mouth	33-48 months

Beef carcass grading

Live animal grading

- This is based on age, sex, condition score and weight.
- Grades:

1. Chiller: equivalent to Super Grade.
2. Good Average Quality (GAQ): equivalent to Choice Grade.
3. Fair Average Quality (FAQ): equivalent to Commercial Grade.
4. X Grade: Economy.
5. Inferior: Manufacturing Grade.

Carcass grading

- This is based on fat cover, age and fleshing index.
- Grades:

1. Super
2. Choice
3. Commercial
4. Economy
5. Manufacturing

DAIRY

Common dairy breeds and their characteristics

	 **F**riesland	**Holstein-Friesian** 	**Jersey** 	**Guernsey** 
Origin	N.W.Europe	Netherlands	Jersey Island	France
Body Weight	600+kg	600+kg	400 kg	500 kg
Milk Yield/annum	5500-7000 kg	Up to 9000 kg	3600-4000 kg	Up to 6000 kg
Butter Fat	3,5-3,8 %	2.5-3.6%	4.6-5.5 %	4.8-5 %
Comment	Udder too big: susceptible to damage	Calving problems	Susceptible to milk fever	Heifer matures earlier than Jersey

Breeding
Performance Target

Activity	Performance target
Heifer bulling age	14-15 months
Weight at bulling	340 kg (depending on breed)
Overall weaning rate	80%
Heifer weaning rate	90%
Weaning weight	42% of mature weight of cow
Replacement heifers2 years weight	66% of mature weight of cow
Age at first calving	2-3 years
Overall herd mortality	Less than 2%

Housing and Facilities
Calf Housing

Days	Requirements
Day 1-35	Individual pens (0.6 m^2 per head)
Day 36-150	Self-feeder units in groups
Day 151+	Paddock grazing

Bull Housing

- Must be well planned so as to give view of cows in the paddocks.
- Light and adequately ventilated.
- Rough floors suitable for better service.

Calf Rearing

The table below is an outline of the methods used to rear calves satisfactorily under good systems of management.

Age	Whole milk	Concentrates	Water	Management
Birth to 4 days	Colostrum 2 kg a.m. 2 kg p.m.	None		Calf runs with dam.
5 - 21 days 22 - 28 days 29 - 35 days	3 kg a.m. 2 kg a.m. 1 kg a.m.	*Ad lib* (calf meal and roughage in equal proportions)	*Ad lib* except while milk is being offered	Put in crates. Dose for tape worm and dehorn at 30 days.
35 days to 5 months	Nil (weaning)	*Ad lib*	*Ad lib*	Enter self-feeder unit 1 week after weaning. Dose for round worms.

Concentrate feed

- Ordinary dairy concentrate may be used, provided about 10% roughage is incorporated.
- Hay should be milled through a 16 mm screen.
- Where snap corn (grain, cob and husk) is used in the dairy concentrate, no further roughage is required. Maize grain may be milled without a screen.

Crates

Calves grow well in crates, suffer less from disease and are easier to control. They are designed to prevent suckling, and encourage consumption of dry food. For a 100-cow herd, no more than 6 crates would be necessary for rearing normal replacements.

Self-feeder unit

- Partly roofed concrete yard in which feed is provided *ad lib*.
- No bedding is supplied but a wall is necessary for protection against harsh weather.

General

- The restricted supply of whole milk is designed to increase the calf's desire to eat dry feed.
- At 5 months of age, calves reared under this system weigh between 160 and 180 kg.

Restricted suckling calf rearing system

Age of calf (days)	Whole milk allowance	Good quality hay	Concentrate
1 – 4	Leave calf with dam (full colostrum).	None	None
5 – 60	2 teats, plus residual milk, left for calf twice daily.	Offered from 21 days	Offered from 21 days.
61 – 90	1 teat, plus residual milk left for calf twice daily Wean at 90 days.	*Ad-lib*	*Ad-lib* to a maximum of 1kg/day.
91 - 180	None	*Ad-lib*	1kg/day

Heifer rearing

Summer-born calves

Time	Feeding
First winter	Take calves out of the self-feeder unit onto a ration of 4.5 kg concentrate and 4.5 kg silage per day. Increase silage as required, to a maximum of 9 kg per day.
Second summer	Gradually reduce concentrate to 1 kg/day a month after green grass becomes available. Discontinue silage feeding as the grass becomes more abundant. Concentrate fed during the summer may be increased or discontinued according to the visible condition of the heifer.
Second winter	Concentrate is again increased to 4.5 kg per day and silage to 9 kg/day as the quantity and quality of the grass declines. This level is maintained until 6 weeks prior to calving when steaming-up commences.
Steaming- up	Concentrates are fed at 5.5 kg per day and silage at 22.7 kg per day. If green grass is available this replaces all the silage.

Winter- born calves

Time	Feeding
First summer	Calves put onto green grass with a ration of 4.5 kg concentrate plus hay. Concentrate is reduced gradually over a month, to 1 kg per day. The hay is removed as the heifer becomes accustomed to the grass.
Second winter	Concentrate is increased to 4.5 kg/day and silage to 9 kg/day as the quantity and quality of the grass decreases.
Second summer	Concentrate and silage are reduced to nil as the green grass becomes abundant again, the condition of the heifer should be the deciding factor.
Steaming-up	See last paragraph in Heifer Rearing Section above.

Dairy Animal Nutrition

Forms of feed

Feed	Usage
Concentrate	There are protein concentrates and energy concentrates. Once silage or green grass is being fed, extra roughage need not be added to the concentrate.
Green grass	Grazing on veld or pastures.
Silage	The silage is generally made from maize, without the use of additives. Silage is fed to provide maintenance requirements for the dairy animal.

Grazing management

- At least five paddocks. Graze on a rotational basis.
- Summer veld (December -March) will provide maintenance if there is adequate grazing close to the dairy.
- Cows grazing veld or pasture over longer distances require higher intakes of energy for their maintenance than cows grazing closer to milking parlours. This needs to be considered when feeding.

Total grazing requirements

- Total LUs x hectares required per LU (this will vary with veld type).

Silage:

With grazing available:

o 1 tonne per LU per winter month, less total production of other feeds, e.g.Lucerne and Oats.

With limited grazing:

o 10 tonnes silage per LU per year (cows only) or 12½ tonnes of silage per LU (to cover all stock classes)

Feed Formulations

- Always start by putting down nutrient requirements of animals and analysis of available feed.

Nutrient requirement for a typical dairy cow

Requirements	TDN (kg)	CP (kg)
Daily maintenance (550 kg lactating cow)	4.0	0.46
Milk production/kg (3.5% butterfat milk)	0.31	0.08

Typical feed analysis

Feed	TDN (%)	CP (%)

Maize silage	19	2.3
Cotton seed cake	72	41.3
Maize meal	80	8.0

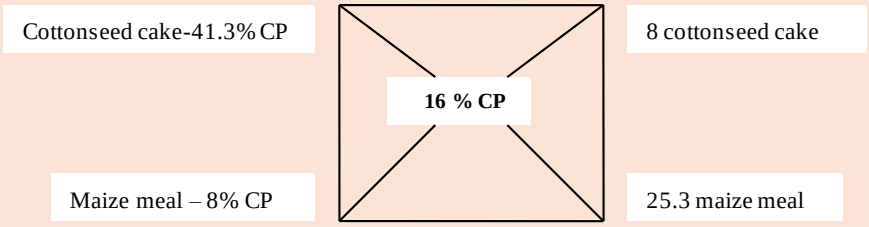
Examples of calculations

Situation 1(using requirements and feed analysis information)
All energy (TDN) for maintenance is to be supplied from maize silage.

What quantity should be fed?
If 1 kg maize silage contains 0.19 kg TDN how much will be required to provide 4.0 kg TDN for a dairy cow's daily maintenance?
Solution:
4.0/0.19 = 21 kg silage
21 kg of maize silage provides 21 x 2.3/100 = 0.483 kg CP

- This quantity of silage therefore supplies protein as well as the TDN requirements for maintenance.

Situation 2(using theSquare Method)
In what proportions should maize meal and cottonseed cake be mixed to make up a 16% CP dairy meal?
Solution:
The desired CP of the mix is placed in the centre of the 'Square' and the CP of each ingredient is subtracted diagonally. The resulting figure is the proportion of ingredient required to give the correct mix.



Method: Proportion of maize meal required
41.3 – 16.0 = 25.3

Proportion of cottonseed cake required
16.0 – 8.0 = 8
This is approximately 3:1 maize meal to cotton seed cake ratio.

Composition of 400 kilograms dairy meal (from the Square Method at 3: 1 ratio)

Feed	**Proportions (kg)**	**TDN (kg)**	**CP (kg)**	**Ca (kg)**	**P (kg)**
Cottonseed cake	100	72	41.3	0.20	1.20
Maize meal	300	240	24.0		1.20
Totals	**400**	**312**	**65.3**	**0.20**	**2.40**
Percentages		78%	16.3%	0.05%	0.6%

Quantity of meal required per kilogram of milk

Butterfat	CP requirements (kg/kg of milk)	Crude Protein (CP) of meal (%)								
		12	13	14	15	16	17	18	19	20
3.0	0.077	0.64	0.59	0.55	0.51	0.84	0.45	0.43	0.41	0.38

3.5	0.082	0.68	0.63	0.59	0.55	0.51	0.48	0.46	0.43	0.41
4.0	0.087	0.72	0.67	0.62	0.58	0.53	0.51	0.48	0.46	0.43
4.5	0.092	0.77	0.71	0.66	0.61	0.57	0.54	0.51	0.48	0.46
5.0	0.098	0.82	0.75	0.70	0.65	0.61	0.58	0.54	0.52	0.49

Stages of lactation

Stage	Description
Early lactation	Cows in the first 8 to 14 weeks of lactation.
Mid-lactation	Non-pregnant cows more than 14 weeks in milk.
Late lactation: >165 days pregnant	Cows which are more than 23 weeks pregnant, *i.e.* within three months of drying off.
Dry period: >225 days pregnant and dry	All dry cows. Do not give concentrates for a few days at the end of lactation to promote drying off.

Note:*Milk yield can drop by 35-40% from early lactation to mid lactation, and by 15-20% from mid lactation to late lactation. Feeding should be adjusted accordingly.*

Feeding systems in dairy production

Feeding system	Details
Conventional	Concentrate fed according to amount of milk produced perparticular cow per day. Feed roughage to cows for maintenance requirements.
Budget	More applicable where average herd yield is about 3000 kg /lactation. Fixed quantity of concentrate is provided to each animal based on expected production. Hay and silage in winter or grass in summer provide maintenance requirements for the cows.
Flat rate	System suitable for high yielding cows (6000 kg milk/lactation). Cows are fed on calculated flat rate for the first 20 weeks of lactation (based on predicted peak lactation yield). Nutrient intake will be similar to conventional feeding. In the 21st week the concentrate allowance is calculated based on expected reduction in milk yield for each subsequent 6 week period. Thedaily allowance is then given in equal quantities reducing in four steps.
Complete diets	Most appropriate when there is no grazing at all (zero grazing) or in winter when grazing is negligible. The concentrate and the roughage proportions of the diet are mixed together and fed as a single feed *ad lib*.
Group	Cows are put into groups according to their daily milk yield or stage of lactation. Concentrate and roughage allocated according to the performance of the group either separately or in complete diets.
In-parlour	Permits accurate allocation of concentrate per cow. For high yields, it does not give enough time for cows to eat their allocation when milked 2-3 times a day.
Computerised out of parlour	Allows individual feeding of concentrates. A computer-controlled food dispenser and a trough are linked to a transponder worn by the cow and she is identified. Then daily concentrate is allocated according to yield and at chosen periods within 24 hours. Feeders are sited outdoors on pasture. *Ad lib* allowances of part (forage) or all (complete feed) of the diet can be incorporated.

Milking labour requirements

Activity	No. Of cows	No. of milkers	Remarks
Hand milking	100	11-12	One man milks 4-5 cows per hour.
Machine milking	100	7 cows/machine/hour	2-3 machines per operator.

Machine milking

- Allow seven cows per hour per machine.
- Numbers of machine/operators depend on parlour system in use.
- 8 machines per operator are possible.
- With inexperienced staff, it is advisable to have 2-3 machines per operator.

Milk quality

Standard milk contains at least:

- 12% total solids (TS).
- 3% butterfat (BF).
- 8% solids-not-fat (SNF).

Standard milk will not decolourise methylene blue within

- Three hours (October - March).
- Four hours (April - September).

(Methylene blue reductase test measures hygiene of milk production and the keeping quality of milk)

Milk hygiene

- Dairy site and buildings must meet standards as given in the Dairy Act before registration by the Dairy Services.
- Milk is an ideal medium for bacterial multiplication that can lead to spoilage and health problems if the milk is consumed by humans.

Sources of milk contamination

- Diseased udder of cow.
- Skin and hair of animal.
- Milker's hands and clothes.
- Dairy equipment/utensils.
- Water used in dairy.
- Dust in the milking parlour.
- Flies and other insects.

Avoiding contamination

- Ensure cows and milkers are healthy.
- Always employ clean production methods. Washing with disinfectant soaps and cleaning of equipment with disinfectant is necessary.
- Washing of hands extends even in between cows so as to reduce contamination from cow to cow.
- Ensure clean water supply.
- Cool milk to 0 -50 C within two hours after milking (preferably 30 minutes) to prevent rapid bacterial multiplication.
- Sanitary facilities for staff have to be provided.

Rejection of Milk

Processors may reject milkfor several reasons, some of which include:

- Odour /flavour which is objectionable or
- Abnormal physical characteristics or colour or
- Contain less than 3% milk fat or
- Be adulterated (e.g. water added).

Health management

Mastitis

- Mastitis is a common condition of the udder when microorganisms enter the udder through the teat canal, multiply and cause inflammation.
- A farmer who notices any abnormal milk produced or the lack of milk where milk should be produced should consult Veterinarian immediately for assistance.
- If identified early, in most cases can be treated successfully.

Contagious Abortion

- Characterized by late abortions.
- Effects include infertility in the animal and reduced milk yield.
- This is caused by the *Brucella abortus* bacteria. The bacteria may be shed in the milk, the afterbirth and the fluids that come out at birth or abortion. These can contaminate grazing areas and spread the disease.
- Human infection may be through handling of infected afterbirth, the fluids or drinking contaminated milk.
- A Brucellosis certification scheme is available for dairy farmers. This ensures that farmers can buy from clean herds and also keep their herds free of the infection by culling diseased stock.

Common health problems in calves

Disease	Age of animal	Causes	Entry point	Control
Navel ill	Soon after birth	E. Coli Fusiformsnecrophorus	Umbilical cord	Disinfect with tincture of iodine.
Calf scours	3-6 weeks after birth	E. Coli(white scours) Clostridium Perfrigeus Salmonella (Paratyphoid)	Mouth	Vaccinate calf or dam depending on cause.
Calf pneumonia	Anytime	E. Coli PasteurellaMultocida F Necrophorus		Clean warm housing. Ventilation. Avoid overcrowding.
Helminths	Beginning of wet season	Tapeworm Stomach worm Liver fluke	Mouth	De-worming
Coccidiosis	Anytime	Coccidia sp	mouth	Use recommended antibiotic.

Dosing program

Parasite	Site	Control	Period
Tape worm	Small intestine	Use de-worming	6 weeks-9 months

		remedies.	
Roundworm	Abomasum	Use de-worming remedies.	2 weeks after rains in Nov, Jan-Feb, Apr-May
Liver Fluke	Liver and bile duct	Use de-worming remedies.	November January February April May

Vaccination program

Disease	Vaccination
Brucellosis (Contagious Abortion)	All heifers at 4-9 months with S19.
Vibriosis	Cows: 30-60 days before calving Annually at calving.
Trichomoniasis	Bulls: sexual rest for cows.
Leptospirosis	Heifers: at 6 months. Annually at calving.
Rift Valley fever	Vaccinate with inactivated vaccine. Annually in Sept/Oct.
Infectious Bovine Rhinotracheitis	Heifers 2-3 weeks before breeding.
Epizootic Abortion (Chlamydia)	Ovine enzootic abortion vaccine may help.
Bovine Virus Diarrhoea	Calves at 6 months. Cows at 30month.
Anthrax	Annual vaccination
Botulism	Annual vaccination
Lumpy skin disease	Annually (Aug-Sept)
Blackleg	Annually

Tick control

- Use appropriate products at recommended concentrations and application methods.
- General recommendations are that dipping should be done weekly during the rainy season and fortnightly in dry season. This is determined by the level of tick infestation.

Milk marketing

- Sell as fresh milk to processors or milk collection centres.
- Sell as fresh milk or soured locally.
- Process into products: yoghurt, cheese, butter.

GOATS PRODUCTION

Main Breeds

	Breeds	Average Doe live weight (kg)	Average Buck live weight (kg)	Kid weight at 12 months (kg)	Kidding rate (%)
Indigenous	Mashona (East African Type) 	25	35	17-18	120
	Matebele 	30-35	45	25	150
Exotic	Boer 	50	65	20-25	160
	Saanen (Milk Goat) 	65	65	25-30	Up to 200

Basic Physiological Data

Activity	Time
Gestation	5 months
Puberty of does	4-6 months but first mating delayed until 12-18 months
Puberty in bucks	6-8 months but first used at 12-18 months

Productive Performance

- Varies depending on breed, management system and conditions.

Pre-weaning slaughter traits of indigenous goats

Traits	
Birth mass (kg)	2.53
Weaning mass (140 days) (kg)	15.2
Pre-slaughter mass (castrates at 18-24 months) (kg)	31.7
Dressing %	43.5

Source: Matopos Research Institute

Note: *The Matabele goats are bigger than the Mashona breeds.*

Causes of kid mortality

- Mortality percentages can go up to 17%.
- Main causes are exposure to extreme weather conditions resulting in pneumonia and death. Housing and protection of kids during the first 6 weeks of life is critical.
- Dams producing little milk: should be culled.
- Weaklings(kids born from multiple births, kids born premature and kids with poor suckling instincts).
- Poor nutrition of the doe during the last stages of the pregnancy.
- Internal parasites

Goat Housing

The standard goat pen

- The site for the pen should slope gently on firm ground to allow good drainage. It should be leeward of the homestead.
- The site should protect goats from: droughts and colds; sun, rainfall and predators.
- Floor should be 1-1.5m above ground level.
- Height: 2-3m (allow 0.5m for ventilation).

Dimensions

Pen	Space requirements
Permanent pen	1.5m² /goat
Over-night pen	1m²/goat
Kidding pen (doe and kid)	3 m²
Permanent buck pen	3m²

Management of meat goats

Activity	Management
Buck to Doe ratio	1: 40-50
Breeding season	Aim to have kidding during dry season to avoid mortalitiesrelated to rains. Kidding normally in: August-October and April-May. Run does and bucks together for 6-8 weeks.

Culling	Does are culled on age and performance.
Identification	Use horn brands, metal tags and paint on horns for grouping breeding does.
Castration	Knife: 3 weeks and older. Burdizzo: at least 3 months. Elastrator: 1-3 days old.
Dipping	Only necessary when goats have ticks or mites. Dip all new goats coming onto the farm.
Foot baths	Recommended during the rainy season to control foot rot. Use recommended disinfectants.
Hoof trimming	Necessary under intensive conditions and during the rainy season when feed is abundant.
Stocking rates (veld)	10-12 goats of about 40kg live mass are equivalent to oneLU (500 kg) (refer to carrying capacity of veld under Beef section).
Stocking rateson planted pastures	5 goats per hectare.

Nutrition

- Goats prefer to browse (70% of feeding time) than to graze (30%). On average, goats spend 8 hours a day feeding.

Goats can be reared under four systems: -

- Tethering system
- Extensive grazing system
- Zero grazing
- Semi-intensive system

Supplementary feeding

Nutrient	Source
Roughage (bulk feeds)	Maize stover,rapoko and sorghum stalks, millet and wheat straws.
Energy feeds	Maize,sorghum,rapoko grains.Maize and sorghum need not be milled.
Protein feeds	Legume residues such as cowpeas,groundnuts,roundnuts,velvet beans or sugarbeans, browse pods and leaves.

Marketing

- Informal markets
- Private abattoirs and butcheries
- Private slaughters

Classifications of goat carcasses

1. Super
2. Choice
3. Standard
4. Inferior

Goat milk

- Can be sold fresh or fermented
- Can be processed to cheese or yoghurt.

SHEEP PRODUCTION

Common sheep breeds

	Breeds
Mutton	Blackhead Persia 
	Dorper 
	Wiltiper
Indigenous Mutton	Sabi 
Dual Purpose	Corriodale 
	S.A. Mutton Merino 
	Dohne Merino

	
Specialised Cross-breeds	Suffolk 
	Dorset Horn 
	Witshire Horn 

Breed weights

Breed	Mature ewe live weight (kg)	Mature ram live weight (kg)
Wiltiper	65	90
Dorper	80	120
Mutton Merino	75	120
Corriedale	70	110

Breeding Management

Ewes (general, depending on breed)

Stage	Time
Puberty	4-6 months (at 16-27kgs)
Mating	15-18 months (12months in controlled breeding)
Productive period	Up to 8 years
Culling age	6 years

Rams

Stage	Time
Breeding age	18-24 months
Culling age	7 years (or earlier if unproductive)
Ram: Ewe ratio	1:50

Mating

- Leave rams with ewes for 6-8 weeks.
- Gestation period for sheep is 144-152 days.

Lambing

Bad management leads to the loss of up to 20% of lambs born.

- At lambing ensure hygienic conditions to avoid spread of infection. Treat ewes with antibiotics as a precaution against infection.
- Ensure lambs get colostrum within the first few hours of birth. Cow colostrum can be used for orphaned lambs or to ensure twin lambs get enough.
- Keep lambs indoors for a day or two if conditions are cold or wet.
- Dispose of orphaned lambs immediately if they cannot be easily reared or if a foster mother cannot be found.
- Provide good shelter for the lambs and ewes.

General sheep management

Item	Description
Castration	At 3-4 weeks, in cool weather (max. hygiene essential). Use elastrator method within two days of birth. Castration is not essential as ram lambs are sold before eight months of age.
Docking	All wool sheep should be docked.
Hoof trimming	Should be done to animals kept under very intensive systems where they have limited walking.
Weaning age	4-5 months, earlier during drought. (Lambs should be separated from mothers for at least two weeks).
Culling	Cull based on feeding, walking, breeding and lamb-rearing ability of sheep.
Shearing	Wool sheep should be shorn in August/September in most areas.
De-worming	Regularly done in the rainy season. Done as per need in the dry season.
Antibiotic treatments	To be done under the guidance of a Veterinary Officer. Withdrawal periods to be adhered to for food safety.
Vaccination	Pulpy kidney, others as per veterinary recommendation.

Sheep Nutrition

- Poor nutrition causes poor reproductive performance for both the ewe and ram.
- For optimum productivity, the flock should have a grazing radius of 1.5-2km from the night kraal.

Guide to lamb weights

	Minimum Weights (kg)	
Age of lamb	**Singles**	**Twins**
4 weeks	10,9	9,0
8 weeks	18,1	14,5
12 weeks	24,5	19,9
16 weeks	29,4	24,9

Pen finishing lamb

- Commercial diets are available.

- Farmers can also do their own home-mixing using proven formulas available from extension agencies.
- For Dorper and Wiltiper breeds, the best livemass at which to slaughter lamb is between 34kg and 39 kg.

Livestock equivalents(for grazing planning)

Class	LU Equivalent
1 Ram	0.25
1 Adult sheep (1 ewe or lamb)	0.20
1 Weaned lamb	0.10
1 Small Stock Unit (S.S.U.)	0.20

Sheep housing and handling facilities

Facility		Specifications
Handling Facilities		
a) Foot bath		3,00m x 0,60m x 0, 25m deep (0,15m fluid depth). Brick walls 0,70m - 0,90m high.
b) Race		Long enough for 30-40 head, 0,45-0,60m wide, walled so stock cannot see out.
Feed trough	Length	3-3,6m
	Width	0,17 - 0,20m
	Height-off ground	0,30m
	Normal feeding	0, 30m/head
	Fast feeding	0, 45m/head
	Ad lib feeding	0.08m/head
Water trough		Not too deep (a brick wall is too wide for lambs unless the trough is brim-full).
Overnight kraal		1, 5 m^2 per ewe and lamb.
Fattening pens		1-2 m^2 floor space/lamb. 3m high roof

Sheep fencing

- Where fencing is required, like with paddocking, a fence with 7 to 8 strands and 1.2 m high is effective.

Marketing and Grading

- Informal markets
- Private abattoirs and butcheries
- Community abattoirs
- Private slaughters

Classifications of sheep carcasses (in the different grades of lamb and mutton)

1. Super
2. Choice
3. Standard
4. Mutton
5. Inferior

Note:*Ram lambs showing secondary masculine characteristics will be graded as Inferior.*

Dressing percentage

- From 40% up to 48% for well finished lambs.

SHEEP AND GOAT DISEASES

Disease Prevention

- Buy in disease free stock.
- Dip and deworm any new sheep or goats before they mix with other animals.
- Deworm animals regularly. If unsure send dung samples to the laboratories for analysis.
- Foot baths (with copper sulphate solution) help to reduce foot rot.

Vaccinations

- Recommended only against pulpy kidney unless there are outbreaks of other diseases in the area. Vaccinate kids at weaning. All other animals to be vaccinated once a year.
- Also vaccinate against *anthrax, blackleg, bluetongue, botulism, pulpy kidney, pasteurellosis,* rift valley fever and any others as per veterinary advice.

External parasites

- Dipping removes external parasites:ticks, lice, mange, and insects.

Internal parasites

- These include flatworms, roundworms,tapeworms and liver fluke.
- They can be controlled by appropriate anthelminthic.
- Dosing programme.

Parasite	Dosing
Roundworms	Start of winter (May, June)
	Start of summer (November)
Wireworms	Mid-summer(January)
Tapeworms	August-September
Liver fluke	August-September

***Note**: Dung samples have to be analysed first and a dosing programme recommended by the Veterinary Officer for economic control of parasites.*

Bacterial infections

- These include anthrax, blackleg, pasteurellosisand pneumonias.
- Vaccinations in most cases prevents infection.
- If infection does occur, then early antibiotic treatment can work.

Viral diseases

- Foot and mouth disease can infect animals and farmers need to quickly inform the veterinary department if there are any suspicious wounds on animals

Orf or Sore mouth

- Causes formation of crusts and scabs on the lips and muzzle.
- Sores may be seen between the hooves.
- Healing eventually occurs after some time.
- Treatment involves isolating animal and bathing them in a mild antiseptic.

- Vaccination can control problem.

Foot-rot

- Commonly affects animals under wet muddy conditions. Animals should be walked twice daily through a footbath containing 10% formalin or 5% copper sulphate solution.

POULTRY PRODUCTION



Broilers Production

- Commercial broiler production is based on hybrids of white feathers.
- Buy day old chicks from reputable distributors, supplied by registered breeders.

Housing

- Should be well ventilated and provide shelter against harsh weather.
- Common types of housing: Deep litter systems (all types of birds), cages (layers only), battery houses (layers only).

Deep Litter System

Most common and popular housing for commercial production

- A brick walls of 40-60cm high.
- 1.6m - 2,1m high wire mesh above the brick wall.
- Sloping roof.
- Allow 10 birds/ m2 (0.1 m2) per bird.
- 12-15mm wire netting covering open areas up to 160cm high.
- Adequate light e.g. one 60-watt electric bulb 2.5m above litter (covers 20m2).
- Concrete floor with 2% slope recommended.
- Foot bath required at the entrance.

Management

- Chick brooding period is from day old to 21 days. Good nutrition, warmth and hygiene during this stage increase the survival rate of the chicks.
- Provide additional warmth from day old to 3 weeks when they have developed feathers.
- Standard room brooding temperature for day old chicks is 30-32 ℃and 32-33℃ for small chicks.
- Temperature should be constant throughout day and night.
- Use thermometers to monitor floor and room temperature in the brooder and also distribution of birds under the brooder.
- Chicks should be evenly distributed in the brooder.

- **Sources of heat**

o Infra-red lights
o Electric heaters
o Kerosene lamps.
o Charcoal burners

- The floor of the brooding house should be covered with litter 15 cm deep so as to keep the birds warm.
- Provide adequate food, light and water.
- Provide enough drinkers (drinking space), 50 chicks per 4L chick front for first 3 weeks of life.

Equipment requirements

Poultry/100 birds	Equipment requirements
First 21 days	3 chick troughs 3 chick drinkers
Day 22- day42	4 water buckets 4 tubular feeders

Note: *One tubular feeder (43cm in diameter) is required for every 20-25 hens.*

SPACE

First 6 days	30-35/sqm
7 days of age	25-30/sqm
14 days of age	15/sqm
Day 22- day42	10/sqm

Rules for successful prevention of diseases: *See section on poultry diseases*

Vaccinations

- Vaccinate against New Castle Disease (in high incidence areas).Consult veterinary services.
- Vaccinate against Infectious Bursal Disease at 10 and at 14 days old.
- Vaccinate against Newcastle at 21 days old.

Performance indicators:

Item	
Feed conversion	2.5:1
Selling age	6 - 8 weeks
Average live mass at 8 weeks	2.0 kg
Average dressed mass (± 75%):	1.5 kg
Mortality	2 – 5%

Feed consumption

Type of feed	**Age in Days**	**Consumption Per bird**	**100 Birds (50 kg bags)**
Starter	0-21	1.0 kg	2
Grower	22-32	1.5 kg	3
Finisher	32-42	1.6kg	3.2
Totals		4.1 kg	8.2

Note: water to be available *ad-lib* all the time.

Manure output:

	Per day		**Per year**	
	Kg	**Litres**	**Kg**	**Litres**
Out-put per100 layers	10	14	3600	5000
Out-put per100 broilers	5	7	1800	2500

Labour

- Depending on the system of housing and available automation, 1 labourer should be able to cope with numbers ranging from 5 000 to 35 000 birds.

Marketing

- Local markets.
- Sell as live or dressed birds.

Layers Production

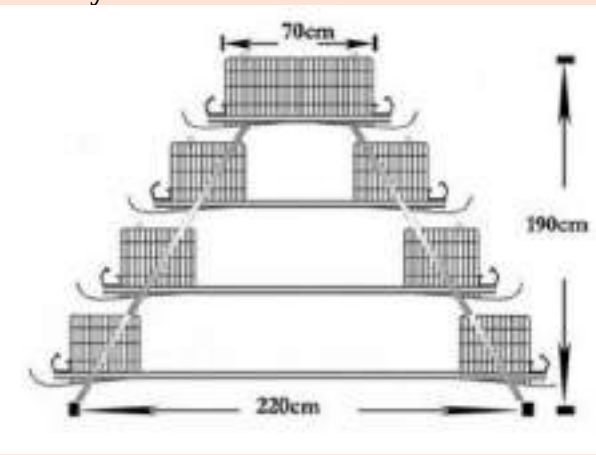
Breeds

- Available Pure breeds
  - Hyline brown
  - New Hampshire Red,
  - Rhode Island Red,
  - Light Sussex and
  - White Leghorns.

- Birds can be purchased as:
  - Mixed day old chicks,
  - Sexed day old pullets,
  - Growing pullets at various ages. Point of lay pullets should be purchased when 16 to 18 weeks old, at 2-4 weeks before point of lay.
- Producers without proper brooding facilities should purchase 6 to 8 weekgrowing pullets.
- Hybrid layers are available from Commercial Breeders. Pure breeds should only be used where fertile eggs are required for hatching.

Housing

Battery house



- This type of housing is expensive. Space required per bird is 0.14 m^2. Birds are housed individually or in batches of up to 5. The bird only has access to feed and water through narrow openings.

Deep litter System

- The buildings should be constructed from a combination of brick, cement and wire mesh or poles and wire mesh.
- Houses should be designed with an open sided structure to promote air movements. The structures are modified according to conditions.
- The same unit can be used for brooding but the sides should have curtains or panels that retain heat and prevent draughts. This type of housing is ideal for large flock sizes.

Floor space requirements

Approximate age	Floor area per bird
0 - 5 weeks	450 cm^2 (0,045 m^2)
6 - 12 weeks	900 cm^2 (0,090 m^2)
13 - 20 weeks	1860 cm^2 (0,186m^2)
During lay from 21 weeks and for a period of 12 months thereafter	2790 cm^2 (0,279 m2)

Equipment requirements per 100 birds

- Drinkers: 5
- Feeders: 6
- Nest boxes: 20-25 (30x30x35cm) (from 21 weeks)
- Perches: 45 cm high and30 cm apart(Allow 20-22cm per bird)
- 2-4 weeks before point of lay, pullets may also be housed in battery cages, for single birds or multiple numbers. To date this is the most advanced housing for laying birds.
- The maximum floor space required per laying bird in cages is 1 350 cm2 (0,135 m2).

Feeds and Feeding

Feed requirement for 100 growers to point of lay:

Age in Weeks	Feed-stuff for Period
0 – 8	275kg Chick mash
9 – 18	710kg Growers mass
19 – 20	150kg Layers mash

recommended commercial layers vaccination program

Age	Feed-stuff for Period
day 10	Newcastle Disease + Infectious Bronchitis (MA5+Clone 30)
day 12	Infectious Bursal Disease (IBD- Gumboro D78)
day 16	Infectious Bursal Disease (IBD- Gumboro D78)
Day 22	Newcastle Disease + Infectious Bronchitis (MA5+Clone 30)
4 weeks	Fowl pox and Newcastle Disease + Infectious Bronchitis
5 weeks	ILT
6 weeks	Mycoplasma Gallisepticum
7 weeks	Infectious Coryza
11 weeks	ILT
13 weeks	Infectious coryza + Egg Drop Syndrome (EDS)
14 weeks	Newcastle Disease + Infectious Bronchitis (MA5+Clone 30)
	Mycoplasma Gallisepticum
16 weeks	Newcastle Disease + Infectious Bronchitis
Every 8weeks in production	Newcastle Disease + Infectious Bronchitis (MA5+Clone 30)

Egg Production per 100 bird flock (12 months of lay)

- Peak production is achieved between the third and sixth month of laying.
- Average feed consumption: 4.5 tons layers mash.
- Average egg production: 2,500dozens.

Mortality

- From hatching to point of lay: 2-5%,
- During laying: 2% across the laying cycle.

Induced Moulting of Commercial Layers

- The productive life of a flock can be extended from 52 weeks to an age of 105 weeks by induced moulting.
- Induced moulting aims to rejuvenate the reproductive system of the hen. This improves subsequent egg production and egg shell quality.

- For complete rejuvenation, egg production must completely stop, which means withdrawal of feed for a period of time. Flocks should be totally out of production for 14 to 17 days.
- About eight weeks after moulting, the hens are returned to egg-laying productivity
- Induced moults should be done on flocks not less than 57 weeks

Negative effects of feed deprivation for moulting

- The animal welfare implications have been criticised by animal welfare activists
- Chickens become susceptible to infection with *Salmonella enteritidis*, the most important pathogen known to be transmitted to humans from eggs.

Disease Preventive measures: *See poultry diseases section*

Manure production by different types of poultry over life

Type of Bird	Amount (kg per bird)
Broiler	1,5 kg
Grower	3,5 kg
Layer	16,7 over 12 months

Labour

- Depending on the system of housing and available automation, 1 labourer should be able to cope with numbers ranging from 3 000 to 25 000 laying birds.

Marketing

- Local or distant markets.

Duck production

Ducks are a hardy species and their production requires little capital investment

Breeds

- For meat, eggs or ornamental purposes.
- Eggs are valued in the bakery industry.

Breed	Purpose	Standard Weights (kg)			
		Young Drakes	Mature Drakes	Young Ducks	Mature Ducks
Aylesbury 	Meat	3.6	4.5	3.1	4
Muscovy 	Meat	3.6	4.5	2.7	3.1
Rounen 	Meat	3.6	4.5	3.1	4
Pekin 	Meat	3.1	4	2.7	3.6
Welsh Harloquin	Eggs	1.8	2	1.6	1.8

					
Khakhi Campbell 	Eggs	1.8	2	1.6	1.8

Housing

- Should be on soil with good drainage.
- Sloping floor 10cm above surrounding ground to prevent flooding.
- Roof to protect from heavy downpours and sun.
- 0.37 to 0.75 m² floor space per bird in yards.
- It is important to provide ponds for bathing and drinking. These should be 1.5 to 1.8 m diameter and 30-40cm deep, 5-10cm watering space per bird.
- Oil drums cut to about 15-18 cm height can serve as ponds. Clean and move them each day to prevent mud forming on surrounding ground.

Feeding breeding ducks

- 20% protein chick mash from 0 to 8 weeks.
- 14-16% protein grower mash from 8 to 20 weeks.
- Give layers' mash from 20 weeks onwards.
- Feed in pellet form is the best for ducks.
- Changing from one feed to another should be gradual to avoid stress.
- Feeding is done twice daily and each bird requires 250-280g feed per day.
- 100-150mm feeding space per bird.
- Considerable savings can be made by allowing ducks to forage.

Fattening ducks

- Give broiler starter mash from 0-4 weeks.
- Broiler finisher mash from 4-9 weeks provided ad-lib.
- 50mm feeding space per bird.
- Age for marketing: 7-9 weeks.

Breeding Management

- 1 drake to 46 ducks for heavy breeds and 1 to 6-8 ducks for light breeds.
- Provide one nest for every 3-4 ducks.

- Start laying at 6.5 to 8 months of age. First eggs not recommended for incubation as they produce weak ducklings.
- Keep ducks indoors up to 8:00 am to avoid eggs being spread over. Ducks usually lay eggs in the morning.
- Store eggs at 13-15 °C and 75% humidity to avoid spoilage.
- Generally, incubation takes 28days, but some breeds take up to 33-35 days.
- Ducks are generally poor sitters and hens can be used. Each hen should be allowed to sit on 10-12 duck eggs.
- Dust nest with disinfectant before sitting.

Brooding requirements

- Well ventilated house in which hay box brooders or infra-red lamps are used.
- About 15cm thick layer of straw is required.
- Temperature should be 32-35 °C first 3-4 days gradually reducing to 29-32 °C down to 26°C during second week. No heating required thereafter.

Prevention of disease

- Housing with clean bedding and good ventilation.
- Clean water to be readily available and accessible.
- Keep an eye for any abnormal behaviour that may alert one of disease.
- De-worm the birds accordingly if necessary.

Common diseases

(See also poultry diseases section)

- Maggots may also infest the tail end of a duck especially where water is inadequate to keep it clean. Treatment: remove the maggots and use a fly spray.
- Internal parasites (especially worms):use antihelminthics.

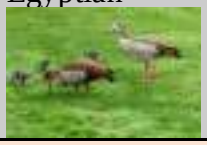
Marketing

- Local markets.
- Live birds or dressed.

Geese Production

Breeds
There are very few pure breeds in Zimbabwe.

Average weight of adult geese

Breed	Gander (kg)	Goose (kg)
Toulouse 	12.0	9.0
Embden 	12.0	9.0
African 	9.0	8.2
Chinese 	6.0	5.5
Egyptian 	4.3	3.5

Breeding

- Reproductive age: 8-9 months.
- Male and Female ratio of 1:4 can be used but pairing is best.
- Eggs collected for incubation should be clean and stored at 13-15 °C for not more than 10days.
- A goose can lay 55-65 eggs per year.

- Incubation period is about 30-32 days.

Housing

- A shed that is closed at the back is enough but should offer protection from storms and predators. The other sides should be covered with wire mesh.
- Floor should be slightly raised above ground to prevent flooding.
- Provide plenty of straw and dry grass for dryness.

Feeding

- Bigger portion of food requirements for geese comes from green plants.
- 10 geese can be raised on 0.5ha of planted pastures.
- Supplementary feeding is needed to increase weight gains:
- 18-20% protein starter mash is used from 0-4 weeks,
- 14-16% protein growers mash from 4 and above,
- Feed in pellet form most ideal.
- Market age is reached at 12 -14 weeks an average weight of 4.5-5.5kg.
- Food conversion ratio should be around 3.2-3.5kg of food to 1kg live weight gain.

Common Diseases

(See poultry diseases section)

- Diseaseslike botulism, white eye and paratyphoidare a problem.

Marketing

- Local markets for eggs and dressed or live birds.

TurkeysProduction

Breeds

Breed	Description
Large white turkey 	For commercial turkey production
Medium white turkey 	For domestic and commercial production
Broad-Breasted Bronze 	Good growth rate, conformation (meatiness), good feed conversion

- Hens of fast growing, heavy roaster turkey species, such as the Large White and the Broad-Breasted Bronze, usually reach a live weight of about 6.8kg at 14 weeks of age; and toms (male turkeys) weigh approximately 13.6kg at 18 weeks.
- Other varieties with inferior economic traits but easier to rear are white Holland, Black, Royal Palm, Bourbon Red, and Narragansett.

Housing


- Brooder house should be reasonably well constructed and well ventilated.
- Use good floors that can be easily cleaned and disinfected; concrete floors are preferred, but wood floors are acceptable.
- Provide adequate floor space for poults (young turkeys) to avoid problems such as cannibalism and trampling.

Floor space requirements (heavy birds)

Bird age (weeks)	**Space required/bird** (m^2)
1 - 6	0.09
6 – 12	0.18
12 - 16	0.27
16 – market (mixed sex)	0.37
16 – market (all hens)	0.27
16 – market (all males)	0.41-0.46

- For light-type turkey, floor space requirements may be reduced slightly.

Management systems

- Turkeys can be reared in confinement or free range. With range rearing, roost and range shelters should be provided.

Equipment

- Basic equipment required should include brooders, feeders, and waterers. Sufficient feeder and water space must be provided to allow each bird equal access.
- Brooder birds require laying nests.

Feed

- Turkeys are fed diets made from grains such as maize and wheat, and soya bean meal.
- Feed additives such as vitamins and minerals can be incorporated into the diets.

Special considerations

- Slow learners should be assisted with feeding and drinking.
- Poults should be kept warm and dry during the first few weeks after hatching.
- Turkeys should be isolated from chickens and other poultry to prevent disease transmission.

Diseases: (*See poultry diseases section)*

Marketing

- Turkeys are marketed as live birds or dressed.

Indigenous chicken Production

Types

- The naked necks; Red Type; White andSpotted.

Housing

Should provide the following: -

- Water tight roof and properly ventilated.
- Predator proof walls.
- 0.23 to 0.28m² space per bird.
- Perches for night resting with each bird requiring 20cm space (1m for 5 birds).
- 30cmX30cmx30cm nesting boxes raised 60cm off the ground.

Breeding

- Maturity age for cocks: 5-6 months.
- Hens start laying between the ages of 20 to 24 weeks.
- Cock to hen ratio is 1:15.
- Laying takes approximately 2 weeks with an average of an egg per day.
- 8 to 18 eggs are laid per clutch.
- Brooding takes 3 weeks.
- Hatchability is about 80%.
- A hen normally runs with chicks for 8 weeks.
- Hen's production life is around 3 years.
- Weaning chicks after 7 days increases clutch numbers and a maximum of 3 clutches per year is possible.

Feeding

In a traditional system, chickens scavenge for food with very little supplementation. Supplementary feeding increases productivity of the birds.

- Give supplementary feed: 60g of feed for scavenging and 125g for penned birds (grains, crushed sunflower, crushed roasted soyabean, vegetable leaves, etc).
- Provide clean and fresh water.
- Commercial feeds can be given or home-made mixes.

Disease control

- Whilst these birds are hardier than the broilersthey still need aerated, clean, dry environment.
- Control and treatinternal and external parasites.
- Treat to remove worm parasites.
- Vaccinate against Newcastle Disease andFowl pox.
- Monitor for Salmonellosis and Avian Influenza.

Marketing

- Local market as live or dressed birds.

Guinea Fowl Production

Breeding

- Guinea fowl are seasonal breeders.
- They breed between 6-8 months of age.
- Breeding starts around September and rounds off around March.
- Mating needs space for the mating run.
- Ideal breeding ratio is one hen to one cock (1:1).
- The guinea cock prepares the nest.
- Keep hens indoors up to midday if nest is indoors.
- They lay between 90-210 eggs per season.
- Collect eggs for fostering with hens or turkeys to have optimum number of keets (guinea fowl chicks).

Egg Collection

- Leave 2-3 eggs in the nest when collecting.
- Older eggs have markings on them.
- Keep eggs in cool dry place with good ventilation e.g. dish.
- When stored in cool place eggs can be kept for a month before incubation.

Egg Incubation and hatching

- Foster incubation allows hen to lay eggs throughout the breeding season.
- All foster hen's eggs must be removed to allow full incubation.
- On average foster chicken hens should be given 20-22 eggs, turkeys 40 eggs and ducks 35 eggs to hatch.
- Turkeys incubate for 28 days just like guinea fowls and chicken hens tire after 21 days.
- The guinea fowl hen can incubate and hatch about 40 eggs.
-

Housing

Housing for Adults

- Grass roof or iron sheets on wood and wire mash.

Housing for Keets

- Keep keets indoors for the first month.
- Use brooding cages to keep keets warm.

Feeding

Feeding and watering keets

- First 2-4 weeks feed keets inside the brooding cage.
- Feed small grains e.g. millet, pearl millet and sorghum.
- Commercial feeds can be used.

Feeding and watering adults

- Use mainly cereal grains and pulses.
- Include as much variety in a single feeding as possible.
- Where available gather grasshoppers and white ants for additional feeding.

Disease control:(*See common poultry diseases section).*

Marketing

- Sell as live or dressed birds or fresh eggs.

POULTRY DISEASES

Common poultry diseases

Name	Principal symptoms	Treatment	Control
Infectious bronchitis	Chicks: heavy mortality & respiratory problems Adults: stop laying	None	Slaughter infected groups. Disinfection of houses. Chick vaccination.
Newcastle disease	Extremely contagious Respiratory problems Greenish diarrhoea	None	Slaughter of sick and infected birds. Destroy carcasses. Disinfection of houses. Quarantine of imported birds. Vaccinate all birds.
Avian Influenza	Extremely contagious Respiratory and intestinal problems	None	Slaughter of sick and infected birds. Destroy carcasses. Disinfection of houses. Quarantine of imported birds.
Pasteurellosis (cholera) (Fowls, ducks)	Heavy mortality Sudden death Diarrhoea	Antibiotics: Oxytetracycline 15mg/kg live body weightby mouth	Slaughter of sick and infected birds Destroy carcasses. Sulfamerazine 0.5% of ration, Chlorotetracycline 0.05% in drinking water.
Fowl typhoid (Fowl, guinea fowl, turkey)	Adults: High mortality Diarrhoea Chicks: Depression,	-Furadolizone 0.04% in mash for 10 days -Chloramphenicol	Hygienic measures, Disinfection of houses, Vaccination.

	Chalky white diarrhoea		
Tuberculosis (all birds)	Stop laying Lameness Mortality	None	Slaughter of sick and infected birds, Destroy carcasses, Disinfection of houses, Quarantine of imported birds, Vaccinate all birds.
Fowl-pox	Cutaneous form: pustular eruptions on crest, eyelids, wattles Mucosal form: false membranes on mouth, nostrils, pharynx Mortality	Local antiseptics, Vitamin A and D	Systematic vaccination.
Avian encephalomyelitis (broilers)	Head and neck tremors Paralysis Heavy mortality	None	Rearing the young apart from the adults. Killed vaccine in AE free flocks.
Chronic respiratory disease	Respiratory signs: rales-dyspnoea	Antibiotics: Streptomycin	Slaughter of sick and infected birds, Disinfection of houses, Agglutination test and antibiotic treatment of new cases.
Coccidiosis	Aqueous and haemorrhagic diarrhoea High mortality in young 10days to 3months	Antibiotics: Oxtetracycline	Disinfection of houses, Separation of young and adults, Coccidiostats.
Infectious Bursal Diseases	Sudden onset of depression White watery diarrhoea Soiled vents, off feed, ruffled feathers, reluctant to move Closed eyes and death.	None Give antibiotics to prevent secondary bacterial infections.	Disinfect contaminated housing using formaldehyde and or iodine containing compounds such as betadine solution.
Infectious coryza	Eye and nasal discharge and occasionally swollen face	Antibiotics in drinking water.	All in allout approach. disinfection of unit, Vaccination.

[Antibiotics should be used under veterinary supervision as they carry a food-borne health risk for human consumers of poultry products]

Biosecurity

- Bring in disease free birds.
- Provide clean fresh water.
- Provide good quality feed to prevent diseases brought by nutritional deficiencies.
- Troughs and drinkers should be clean.
- Avoid stressful situations for your birds.
- Do not mix flocks: keep different flocks separate.
- Keep different age groups separate.
- Vaccines /medications should be given on time.
- Isolate sick birds.
- Take 1 to 3 dead birds to a Veterinary Officer for diagnosis, destroy in a manner that other birds have no access to the carcass.
- Restrict visitors to those with protective clothing.
- Keep out wild birds.

Internal parasites(roundworms, flatworms)

- Poultry are susceptible to a lot of internal parasites. Dung samples can be collected for analysis.

External Parasites(mites, ticks, lice, fleas)

- Birds are also susceptible to external parasites.
- Provide treatment for affected birds.

OSTRICH PRODUCTION

Ostriches

The ostrich is farmed for its skin used for leather, for its feathers, which are decorative and are also used for feather dusters, and for its meat marketed commercially.

Breeds

Struthio camelus

- The ostrich is native to Africa.

Breeding management

- Buy birds which do not show any signs of disease or abnormalities.
- Breeding Ratio: Cock: Hens ratio between 2: 3 and 1: 2.
- Breeding age:
  - Cocks should always be a year or older than the hens.
  - Maturity Age: Cock: 24-36 months.
  - Hen : 18-24 months.
- Breeding season: extends from May to November/December.

Housing and Spacing

- The Ostrich Breeder Paddock: Site paddocks on well-drained soils on slightly slopping ground. Ideal site would be far from busy roads with few shady trees.
- Paddock size ranges for 1 to 3 acres (0.5 to 1.5 ha) for a breeding pair depending on space available.
- 4 to 5 strands of high strain plain 8- or 10-gauge wire required. Standards should be placed 5 to 6 metres apart with 3 to 4 droppers in between. The lowest strand of wire should be 45cm above the ground.

Feeds and Feeding

- Breeding birds: 2-2.5kg ostrich breeder meal (three weeks to the breeding season).
- Non-breeding season birds: 1-11/2kg of ostrich maintenance feed.
- Changing feed:
  - Changing type of feed or the supplier should be avoided during the breeding season. Have gradual change from breeder maintenance to breeder mash (or the reverse).

- Supply fresh clean water. An adult bird requires around 8 - 11 litres of water every day.

Management of Hatching

Care and handling of ostrich eggs:

- Collect as soon as they are laid.
- Clean with a clean dry cloth.
- If eggs are soiled, wash with warm water (around body temperature) for not more than 2 minutes and left to air dry. Clean fresh water should be used for every egg. A mild antiseptic can be used. Water should only be used when it is completely necessary.
- Store with the blunt side up - in a container with protective material such as foam rubber. If straw is preferred, eggs should be wrapped in clean newspaper before being placed on the straw. The container with eggs should be stored in a cool place.
- Eggs should never be shaken.
- Storage temperature should be between 13 and 18 0C.
- Maximum storage time: 10 days.

Incubation and hatching of ostrich eggs

- Ostrich eggs can be incubated artificially or naturally. Removal of eggs from the nest induces hens to lay more eggs. With high numbers of eggs, natural incubation will not be as efficient as artificial incubation.
- Carefully controlled environment in artificial hatching will also ensure higher hatching percentages.

Artificial incubation

- Humidity: 35% and 40%.
- Candle the eggs after 14 days of incubation: an infertile egg is translucent throughout the length of the egg.
- Eggs should be turned 5 to 6 times a day. Eggs set on their sides should be rotated through an angle of 180° whilst those set at 45° should be rotated through 90°.
- Optimum temperature is 36 0C.
- Eggs normally take 41 days to hatch.

Hatching

- The eggs are transferred from the incubator to the hatcher after 38-40 days or as soon as internal pipping can be heard.

The Hatcher

- Pipped eggs should be transferred to a hatcher. They will last 3-4 days in the hatcher.
- The temperature in the hatcher should be a degree lower than in the incubator.
- Assist chicks to hatch, take care not to injure the chick or rapture the umbilicus.
- The navel of the just hatched chick should be sprayed with an antibiotic.
- Keep the chicks in the hatching room for 8 hours then move into a brooder.

Chick brooding

- Stocking density:
  - 6 chicks/m² in the first week.
  - Increase by 10% until the 4th week.
- Temperature - be maintained at 35 0C 1st week and reduced by 3 0C up to the 4th week.
- Teach the young chicks to feed. The newly hatched chick is only ready to start feeding after 24 hours.

- Provide clean fresh water 3 times a day.

Management of chicks *(up to 3 months)*

- Move chicks from the brooder into chick pens at 4 weeks.
- Provide grit at the rate of 4-5 stones/chick per day.

Management of growers

- Transfer chicks from chick pens into rearing pens at 3 months.
- Transfer growers into grower paddocks at 5-6 months. Use high strain 10-8 gauge plain wire for grower paddocks. Barbed wire should never be used on ostrich paddocks.
- Introduce growers feed to the growing birds and introduce greens e.g. vegetable wastes and Lucerne. Grit and pebbles should also be provided for the birds.
- Provide clean fresh water at all times.
- Growers are ready for slaughter at 10 to 14 months of age.

Feeding and watering troughs


- Use clean shallow chick feeding and watering troughs for young chicks. Use mild detergent and steriliser before they are used on a new batch of chicks.
- Use old tyres as feeding and watering troughs for older birds. Clean troughs thoroughly daily. Avoid metal troughs.

Common ostrich diseases and their treatment

Disease/ Condition	Cause & Symptoms	Treatment	Prevention
Newcastle	Virus: Nervousness, bent neck, paralysis, swelling head convulsions and death.	Not specific	Buy stock from certified flocks. Quarantine affected farms. Kill all affected birds.
Avian pox	Pox virus: Blisters/crusts on beak, eyelids and head.	No specific treatment. Only treat secondary infection.	Keep ostriches away from poultry. Vaccinate birds that are likely to contract diseases especially those close to poultry.

Omphalitis	Bacterial coming from wet bedding: Weak chicks, sudden death of chicks younger than ten days.	Usually too late.	Good hygiene in incubator & brooder. Spray umbilicus with antibiotic soon after hatching. Keep floor and bedding dry in brooder and chick pens.
Pneumonia	Bacterial: Chicks dead in shell (DIS), coughing, respiratory distress and death in chicks. Loss of condition in older birds.	Usually not successful in chicks but antibiotics can be incorporated in their feed.	Give chicks at risk antibiotics in feed (Consult a Vet.)
Impaction	Nutritional: Excess fibre in feed, fasting, lack of grit and pebbles, excess sand swallowed by chicks, foreign objects e.g. sticks; and stress. Signs: Retarded growth, poor condition, depressed appetite, constipation and lethargy.	Dose with Epsom salts in water:1/4 teaspoon for small chicks and 2 table spoons for adult birds. Repeat once or twice daily. (Not always successful).	Provide only recommended quantities of digestible fibre to chicks. Avoid fasting and provide grit as recommended.

Note: Internal and external parasites need to be dealt with as in other birds.

Marketing

- Market as live birds or dressed,
- Market fresh eggs,
- Market skin,
- Market feathers.

RABBITS PRODUCTION

Breeds

Breed	Colour and marking	Mature mass (kg)	
		Male	Female
Californian 	Pure white body, dark coloured nose, ears, feet and tail	3,6-4,5	3,7-4,7
Chinchilla Giganta 	wild agouti	4,5	5,0
Flemish Giant 	steel grey	5,0	5,5
New Zealand Red 	reddish gold	3,5	3,5
New Zealand White 	White	4,0	5,5

Housing and spacing

Hutches:

- These can be wooden or metallic(more durable and hygienic but expensive).

Hutches	Measurements
For breeding does and does with young	90 x 60 x 45cm high
Mature bucks	65 x 90 x 45cm high
Growing rabbits:	45 x 90 x 45cm high

Note: *In rural areas hutches must be of sufficient strength and height to prevent dogs, jackals and other predators from eating the rabbits.*

Floor

- Wire floors allow faeces and urine to escape, reducing building up of disease.
- All solid floors must be covered with bedding material e.g. sawdust, straw, hay, leaves, wood shavings and dry grass. Damp bedding has to be constantly changed.
- Concrete floors, or ground, below wire cages must be covered with sawdust to absorb moisture and urine.

Floor space

- Doe plus litter — a minimum of 0,85 m2
- Growing rabbits on wire floor need 0,093 m2/rabbit 0,140m2 to 0,168 m2 on solid floors.

Nest

- Boxes: 41cm long x 30cm wide x 30cm high with a pop-hole for entrance.

Breeding

- Does: sexually mature at 3,6kg live mass or approximately 6 months old.
- Does on high plane of nutrition mature earlier.
- Larger breeds have longer maturing period (8-10 months).
- Bucks: Sexually mature around 6 months of age.
- Buck/Doe ratio: 1:10 to 1:15.

Mating

- Rabbits breed throughout the year. The doe should always be taken to the buck, never the reverse. Repeat 3 days later.
- Gestation Period: 29-34 days.
- Litter size:Between 3 and 15 but a commercially viable litter size is 8 -10.
- Weaning age: 4 - 8 weeks depending on level of management. Wean by moving the doe to another hutch. Young rabbits are run together until 3 months of age then either slaughtered or the sexes separated for breeding.
- Both doe and buck work for 2-3 years.

Feeds

- Grasses: couch grass, star grass, finger grass.
- Weeds: blackjack, *(Bidens pilosa)*.
- Tree leaves: orange, lemon, mango, and banana.
- Fruits: melons, mazhanje*(Uapacakirkiana)*.
- Crop residues: groundnut leaves, Bambara nuts, rapoko stalks, bean leaves, cowpea leaves, sweet potato leaves.
- Vegetables: cabbage, lettuce, spinach, rape, carrots, beans.
- Water should be continuously available.
- Poisonous plants to rabbits: Irish potato leaves, tomato, egg plant, pepper, onion and garlic.

Note: *If diet has to be changed, it has to be gradual, not sudden*.

Supplementary feeds for small scale production

- Home-mixed rations
- Example:
  - 10 kg maize + 10 kg rapoko + 1 kg sunflower + 0, 05 % salt or
  - 10 kg maize + 10 kg finger millet + 1 kg sunflower + 0,05 % salt
- These mixtures should be crushed into a coarse meal.
- Commercial pellets can also be fed to rabbits over good quality greens and hay.

Slaughter weight

- Live Mass at 12 weeks: 2.0-2,5kg.
- Dress out percentage: well-fed rabbits 57-63% (with head).

Diseases

- Strict hygiene practices prevent disease outbreaks.

Common diseases

Name	Symptoms	Treatment
Coccidiosis	Lack of appetite, diarrhoea, listlessness, weakness and sudden death.	Commercially purchased pellets may contain a coccidiostat. ESB3 dissolved in water.
Snuffles	Sneezing and a sticky-white nose discharge.	Antibiotics- for valuable animals.
Sore Hocks	Skin becomes softer and the pads thinner	Affected parts to be washed in warm water and mild antiseptic, and an iodine ointment applied.
Pasteurellosis	Animal dies after a short illness, showing lesions of pneumonia, pleurisy and peritonitis.	Appropriate Antibiotics.
Ear Canker	Grey scabs in the ear causing irritations.	Benzyl benzoate, old motor oil, medicinal paraffin or vegetable oil. Best to treat daily using a non-irritant parasiticide. These are wetted on the whole surface area and the affected parts of the ear. Ivermectin injectible / ointment.
Heat stroke	Panting, uneasiness, slobbering.	Wetting of the animal with cold water.
Mange	Exuding serum and appearance of scabs around the head. Hair dropping off.	Clip off hair ,apply sulphur ointment Ivermectin injectible / ointment.
Myxomatosis	Head and body swell, closing of eyes, death.	Vaccination (contact local Vet).
Snuffles	Persistent sneezing.	Isolate sick animals Antibiotics may be used for valuable animals.

Economic size

- For small scale production one buck and two or three does would suffice for a start.
- 400 does or more is considered an economic unit for a major rabbit enterprise.

Marketing

- Slaughter at 10 to 12 weeks.
- Sell as dressed or live.

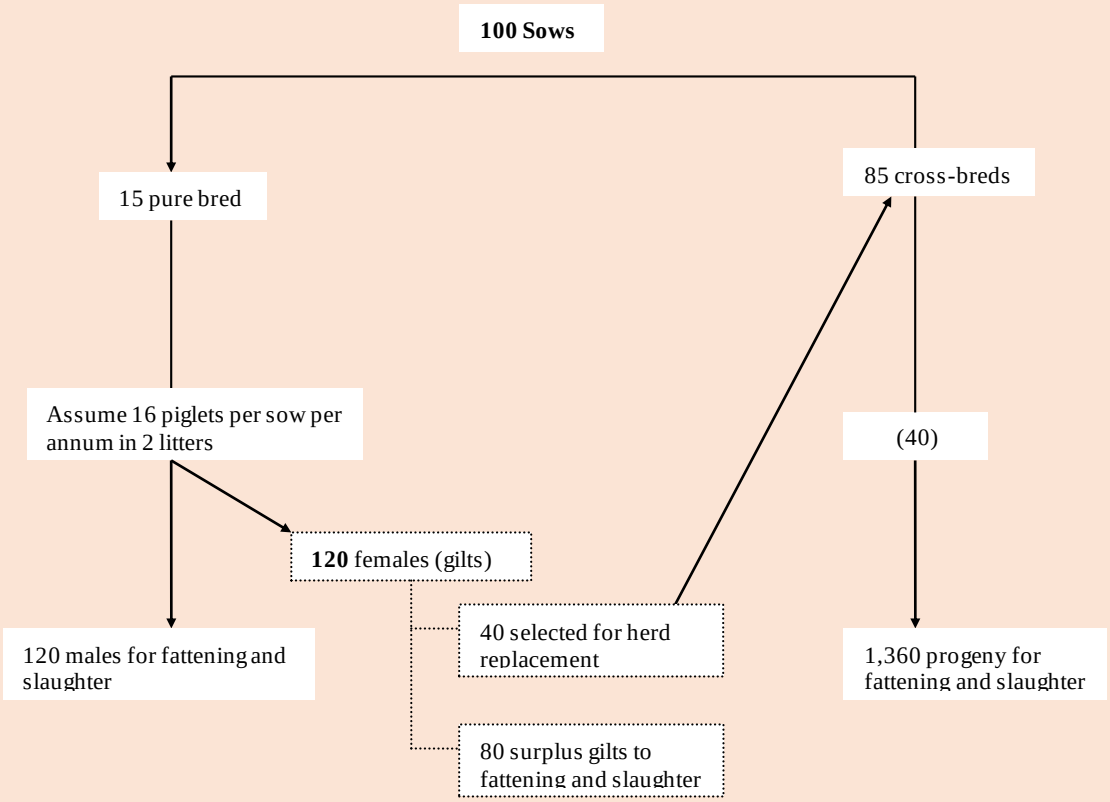
PIG PRODUCTION

Breeds and Breeding

Type of breed	Characteristics
Large White 	White coat Prick erect ears Good food convertor
Landrace 	White coat Lope floppy ears Long carcass
Duroc 	Cherry red coat Fast growth Good food converter
Hampshire 	Black with white saddles across shoulders Prick erect ears Good mothering ability

Breeding

- Smallholder producers should buy first-cross females from Pig Industry Board (PIB).
- Large producers may maintain a pure-bred herd as follows:



General management

Activity	Target
Sow replacement	9 parities if giving good litter size (10 live piglets)
Boar replacement	Every 2-3 years
Breeding age (gilts)	First heat after 180 days
Boar to sow ratio	**1:15-20**
Gestation period	114 days
Castration	Knife-<4 weeks old (1 week of age best)

Mating the sow with the boar

- It is important to make sure that the sow is at the correct time of the oestrus period before mating takes place.

Mating pen

- 9m2 minimum size with no projections.
- Non-slip, well bedded and dry floor.

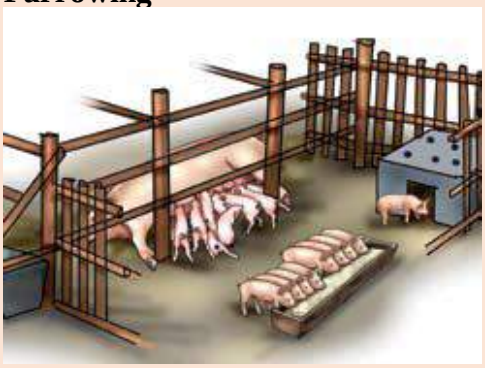
Mating in pen

- Select a suitable boar not used within 24 hours.
- Move sow to boar pen and allow mating to begin.
- If necessary, guide boar into vulva (wear plastic disposable gloves).
- Watch for the two to lock into the cervix. The boar will stop thrusting.
- Observe below the boar's tail for pulsation of the urethra as insemination takes place.
- Observe that there is no leakage of semen.
- Mating takes 5-10 minutes.
- Give the boar a 48-hour rest between each complete sow mating.
- High conception rates possible by this system of mating.

Outdoor sow herds

- Where group mating is used, it is important to ensure that the boar: sow ratio is correct and that all boars are actually serving.
- Advantage of less labour requirements.
- System usually has lower conception rates.

Furrowing



- Furrowing facilities should be clean and sanitized to prevent infection of newborn pigs.
- Be present during farrowing.

Management after farrowing

- Disinfect navels the day piglets are born using iodine at 50:50 iodine/alcohol solution.
- Make sure the piglets get colostrum.
- Disease resistance is lowest at 3 weeks.
- Clip needle teeth.
- Dock tails when piglets are one-day old.
- Give iron injections to prevent anaemia.
- Control pig scours.
- Piglets should be fed unlimited quantities of creep feed from day 7.

Weaning

- Weaning age depends on level of management.

- Pigs can be weaned from 5 - 8 weeks. Weaning under 5 weeks requires more skills and higher levels of management.
- After weaning, mix litters 2 weeks later. Put pigs in groups of 20-25 per pen. With lower levels of management, groups can be of 16 animals or less.
- Sort pigs according to size and weight.
- Control parasites.
- Minimize stress at weaning.

Housing and Facilities

Space Requirements

Types	Category	Spacing
In Sow	Stalls:	2 m long x 0, 64 m wide
	Cubicles:	As for stalls plus similar dunging/exercise area
	Yards:	3-4 m^2 per sow
Farrowing	Crate:	2 m long x 0, 7 m wide
	Pen including crate:	6, 2 m^2
	Solari farrowing/follow-on (including creep area)	10 m^2
	Multiple suckling:	7-8 m^2 per sow and litter.
Weaners	Cages (per pig):	0, 2 m^2 lying area + 0, 2 m^2& slatted area
	Yards (per pig):	0, 7-0, 9 m^2
Porkers	(pen including dunging area):	0, 73 m^2 per pig
Baconers	(pen including dunging area):	0, 93 m^2per pig
Boar:		3 m x 3 m for lying and dunging
Service pens	(sows and gilts):	2 m x 2 m facing pens housing boars (encourages heat)
Trough space (per pig)	Light porkers	0,20 m^2
	Heavy porkers	0,25 m^2
	Baconers	0,30m^2
	Maiden gilts, sows	0,35 m^2
All	Doors	0, 6 m wide x 0, 9 m high.

Building requirements

- Allowance must be made for peak farrowing periods, for growing pigs, and to wash, clean and rest pens between batches.
- The following is a summary of housing requirements for a 100-sow herd:
  - Boars: 5 pens,
  - Replacement gilts: 8 places, i.e. 2 pens hold 4 gilts each,
  - Dry sows: 75 stalls or cubicle places.
-

Farrowing and follow-on:

System	Ages	Requirements
System 1:	Using farrowing/follow-on pens until litter is 10 weeks of age.	45 Solari or similar pens
System 2	Using specialized farrowing to 3 weeks of age and separate follow-on pens from 3-10 weeks.	20 crates plus 40 Solari *or*similarpens
System 3	Using specialized farrowing to 3 weeks of age, follow-on to 5 weeks, then cages from 5-10 weeks.	20 crates plus Solari *or*similarpens plus 15 cages
Finishing	10 weeks to slaughter	
	Pork	32 pens each holding 10 baconers
	Bacon	65 pens each holding 8 baconers

Hygiene

- Clean pens between batches of stock. Use detergent to remove grease and disinfect Allow 7 days between batches of pigs. Re-disinfect in afternoon before restocking pens.
- Dry-sow housing need not be washed as exposure to virus and bacteria tend to give immunity to sows which will be passed to young piglets.

Nutrition and Feeding:

- Best to purchase concentrate and mix with home-grown maize. Two rations can be fed to growing and finishing pigs:
  - high protein concentrates to porker weight,
  - low protein concentrates to baconer weight.

Feeding

Stage	Feed	Amount
Piglet	Creep	0.45 kg per piglet up to five weeks of age
Up to 50 kg live weight	Grower	1,8 kg per day per pig
Larger pigs	Grower/Finisher	1.8 to 2.3 kg daily
Pregnant sows	Brood Sow	1.8 – 2.7 kg daily
Sows after farrowing	Lactating Sow	0.45 kg per sow and 0.45 kg per piglet by 10th day.
Boars	Boar/Sow meal	2.25-2.75 kg daily

Feed required per pig in kilograms

Type of feed	Medium Porker ± 55 kg live mass	Large Porker ± 72 kg livemass	Baconer ± 85 kg livemass

Share of sow	75	75	75
Creep ration (to 8 wks)	20	20	20
Grower ration (up to 55 kg live mass)	125		
Grower/Finisher (single ration from 8-9 weeks onwards)		175	225

Feeding by-products

- Potatoes, carrots, cabbage, whey, brewer's by-products, swill can partially replace more expensive ingredients.Specific advice should be sought where such by-products are available for feeding to pigs.
- Marginal feedse.g.,sweet potatoes, maize bran, cabbages. These on-farm feedscan be fed to pigs used for home consumption or where high carcass quality is not particularly important.

Labour requirements

- Allow one foreman plus 7 general workers per 100 sow unit.
- For every additional 100 sows allow seven general workers.

Health Management

Vaccination

1. **Farrowsure-** Vaccination of healthy breeding swine as an aid in preventing reproductive failure.

Primary Vaccination: Healthy swine should receive 2 doses 3-5 weeks apart with the second dose administered 2-4 weeks prior to breeding. Healthy gilts, however, should receive the second dose as near as possible to 14 days prior to breeding.
Revaccination: Revaccination with a single dose is recommended prior to subsequent breedings. Boars should be revaccinated semi-annually.

2. **LitterGuard-**Vaccination of healthy, pregnant swine as an aid in passive maternal immunisation of their piglets against neonatal diarrhoea

Primary vaccination: Administer 2 doses at least 2 weeks apart. The second dose should be given at least 2 weeks prior to farrowing.
Revaccination: A single dose should be administered at least 2 weeks prior to each subsequent farrowing.

3. **RespiSure-** Vaccination of healthy swine as an aid in preventing chronic pneumonia.

Primary vaccination: Administer a single 2 ml dose to pigs approximately 1 week of age with a booster dose 2-3 weeks later. Pregnant swine may be safely vaccinated at 6 weeks and 2 weeks prior to farrowing.
Revaccination: Dams should be revaccinated 2 weeks before farrowing. Boars should be revaccinated semi-annually.

Parasites

Category	Type	Symptoms	Treatment
External	lice, ticks, fleas, flies, and mange mites	-Skin irritation -Scratching -Restlessness -Physical injuries occur -Retarded growth	-Fortnightly spray with an anti-mange compound until the problem is resolved. -If skin irritations are a continuous problem then seek veterinary advice. -It is advisable to spray all animals before transfer to new pens.
Internal	Round worms, Tapeworm, Nodular worm	-Measles -Dry cough Eggs in faeces -Slow growth	-Dose using antihelmintic products. -Prevent animals from eating human excreta.

***Note**: -Use a proprietary dosing compound most suitable for the type of worm burden encountered. Always consult a veterinarian. Ivermectin can be used for both internal and external parasites control in pigs.*

Other diseases

Disease	Causal factor	Signs	Treatment/Control
Mastitis-Metritis-agalactia	MMA syndrome	-White to yellow discharge from the vulva -Inflammation, tenderness and hardening of the udder -Depression -Loss of appetite -Sow prevents piglets from suckling	-Antibiotics and corticosteroids (consult a Vet). -Feed with 0.5-1 kg of bran /day for a few days before farrowing.
Collibacillosis (E. Coli)	Sudden change in feed after weaning	-Diarrhoea 2-10 days after weaning -Sudden death	-Vaccinating with E. coli vaccine -Good hygiene -Limit stress during weaning.
Swine dysentery	*Brachyspirahyodysenteriae*	-Bloody diarrhoea -loss of weight -Coarse hair	-Consult Vet to provide a treatment programme.
African Swine fever	-Virus (transmitted via other animals)	-Stop eating and huddle together -Slow uncoordinated movement -Mucus discharge from eyes and nose -Reddened skin -Rapid and difficult breathing	-Destroy all infected animals -Report outbreak.
Pork Measles (zoonotic disease)	*Taenia solium* Usually problem in free range pigs	Poor weight gain	Avoid access to human faeces. -Build ablution facilities

Transporting Pigs


The transportation of pigs to a slaughterhouse imposes stress on the animals.
Reduce deaths by:

- Not feeding for at least 10 hours before loading.
- Use a properly designed loading pen with solid walls and a ramp and do not put animals of different mass (for example, porkers and baconers) together.
- The truck must provide a cover overhead.
- Use subdivisions in truck with not more than 10 animals together.
- The floor should be non-slippery.
- Avoid stoppingen route to the slaughterhouse and travelling during hot periods of the day.
- Transport during early hours of the day or later during the day when temperatures are dropped.

Grading

Grading and classification of pigs

Class	Grade
Under mass (< 35.0 kg CDM)	INF
Porkers (35.0-64.9 kg CDM)	1 2 3
Baconers (65.0-90 kg CDM)	Super Lean 1 2 3
Manufacturing (sows/boars)	A
> 105 kg CDM	B INF

Market

- Market as live to processors or dressed locally.

FISH PRODUCTION



Fish Farming (Aquaculture)
This is the practice of raising fish in fish ponds, tanks and cages.
Common species used in aquaculture in Zimbabwe are:

- *Oreochromis mossambicus:* Mozambique bream or white bream

Oreochromismacrochir: green-headed bream

Tilapia rendalli: red-breasted bream

Oreochromis niloticus: Nile tilapia

The common name for these bream species is ***Tilapia.***

- *It should be noted that the Nile tilapia is not indigenous to this country and to breed it requires authorization from National Parks and Wildlife Authority. Its uncontrolled use can lead to its escape into natural river systems and negatively impact on biodiversity.*

Characteristics of the tilapias

Species	Food habits	Growth habits	Production: kg/100m^2/year
White bream (*Oreochromismossambicus*) 	Algae, Artificial feeds	Maturity in 3-4 months Max. size: 1.7 kg	30 – 70
Green-headed bream (*O. macrochir)* 	Algae, Artificial feeds	Maturity in 8-12 months Max. size: 1.2 kg	30 – 40
Nile tilapia (*O. niloticus)* 	Algae Artificial feeds	Maturity in 6-7 months Max. size: 2.5 kg	30 – 80
Red-breasted bream (*Tilapia rendalli)* 	Pond grass, Artificial feeds	Maturity in 7 months Max. size: 1.3 kg	20 – 30

- The ideal temperature range for tilapia growth ranges from 200C to 350C. In the highveld, tilapia production will therefore be affected by the cold season. There will not be any growth for at least three months of the year.
- In the lowveld, it is possible to grow tilapia throughout the year because of the generally higher temperatures.

Advantages of Tilapia

- They grow very well in still and warm waters
- They multiply very fast
- They feed on a variety of cheap feeds.
- They are relatively resistant to most common fish diseases
- Their taste is appreciated by most consumers

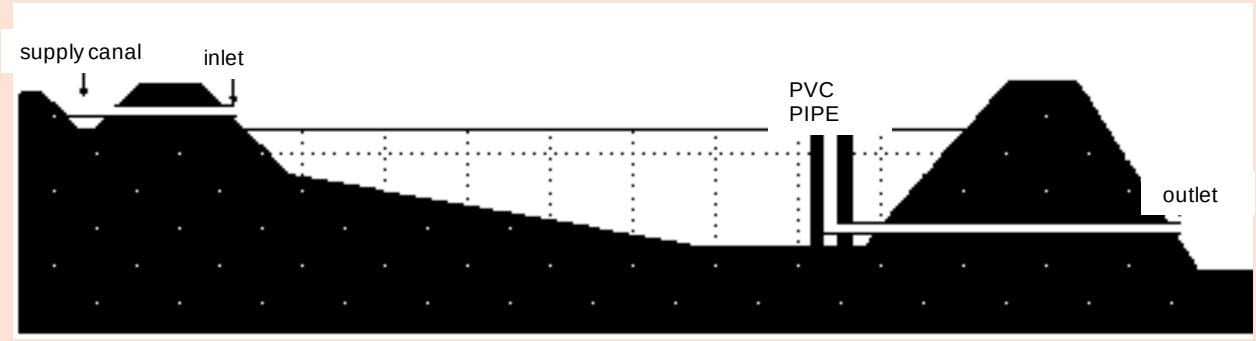
Site Selection

- Area must have a reliable source of good quality water preferably gravity fed
- Select land with gentle slope and layout ponds to take advantage of existing contours
- Soil must be of good water holding capacity. A simple test is to dampen soil and squeeze it into your hand. If the soil keeps its shape when hand is opened, then it isgood. If the sample collapses, then it is not good.
- Avoid rocky areas and were there are protruding tree stumps

Fish pond design

- Minimum recommended fish pond size: 200m2.
- Water supply: must be enough to fill ponds at least 8 months of the year. The pond can be filled with water from ground seepage or supplied by canal.
- Pond shallow end depth: 50 cm.
- Pond deep end depth: 150 cm.
- Ideally, a fish pond must have its own inlet for water supply and an outlet for draining so that water does not flow from one pond to the next in case of diseases or poisoning. The inlets must have screens to prevent entry of unwanted fish or predators (if pond is fed by canal or pipe from dam or river).
- Outlets should also have screens to prevent loss of fish with drainage.
- Suitable plastic or pond liners can be used to improve water holding capacity of ponds on sandy soils

Cross section of a fish pond



Note:*PVC pipekeeps the fish pond's water at a constant level by acting as an overflow. The PVC pipe has an elbow that allows it to be tilted at different angles to drain the pond during harvesting*

Earthen fish pond

Fish Stocking

- The stocking rate is dependent on the level of management and production system. A stocking rate of 3-5 fish per/m2 is recommended for ponds being fed manure. Where commercial feeds are applied, the stocking rates can go up to10-12 fish/m2. With any further increase in stocking rate, oxygen available to fish then becomes limiting and artificial aeration might have to be used.
- To eliminate the potential problem of overstocking in fish ponds through excessive breeding, stocking with males only is recommended. As males tend to grow almost twice as fast as females.
- The fish pond environment should have a neutral water pH of 7 to 8.

Fish transportation

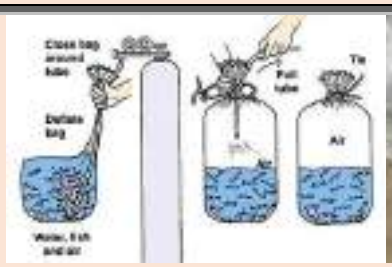
- Starve fish for 12 hours before transportation to avoid defecating and spoiling of water
- Fish of different sizes should be packaged separately
- To ensure that fish are not damaged they must be handled with wet hands and handled gently to avoid physical damage and reduces the amount of stress on fish.
- Use the most appropriate transportation of for the distance, the shorter the transportation period the less risks for deaths

Transportation methods

Bucket– Fingerlings are placed in an open container or bucket filled with water to capacity. The container should remain open during transportation to increase the amount of dissolved oxygen (DO) as the water splashes out.

It is advisable to carry extra water for topping up the containers. This method is ideal for very short distance and for smaller quantities of fish.

Plastic bags



Fingerlings in a thick plastic bag filled to approximately a third with water and two thirds oxygen. Seal the bag with cable ties or equivalent and place in another bag and seal again. Then place the bag on ice or cool-packs in an insulated box e.g. polystyrene, place more ice on top and seal the container. This is the safest way of transporting fish over long distances and the fish can survive for up to 24 hours in the bags.

Special containers and aerators –

A battery powered aerator is fixed to the lid of a large metal or fibre-glass fish tank fitted into the back of a truck. A steady supply of oxygen is administered to the fish throughout the transportation time. Alternatively, a battery powered agitator is fitted to increase the rate of oxygen diffusion into the tank spinning in the water. Large volumes of fish can be moved over long distances in this way. The method is used when stocking large ponds and dams.

Introducing fish into ponds

To reduce shock and stress caused in the transfer of fish from containers to the fish pond the following must be taken note of;

- Container must be placed in the pond (3/4) without allowing the fish to escape for 10 minutes
- When the water temperature in the container and pond have equalised, gradually introduce water from the pond into the container which allows the fish to adjust to the new water temperatures. Finally submerge the container in the pond and allow the fish to swim out into the pond.

Fish pond management

Fertilisation

- Fertilisation is necessary in the pond to provide natural fish food. Organic and inorganic fertilisers release minerals in the water which, together with the energy from the sun lead to proliferation of phytoplankton (algae) in the pond. Algae form the basic diet of tilapia. This gives the green colour to the water in the fish pond.
- Organic fertiliser (manure and compost) are applied at the following recommended rates:

Type	Application rate kg/100m^2/week
Cow dung	10
Goat/sheep	8
Pig	5
Poultry	4

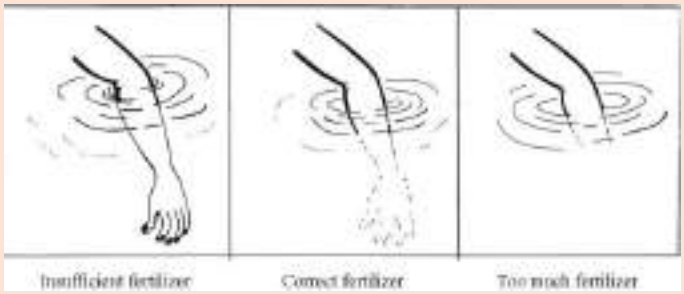
- Inorganic fertilizers (commercial fertilisers) are applied at the following rates:

Fertilizer type	Application rate (g/100m^2/month)
Single super phosphate (SSP)	450
Double super phosphate (DSP)	225
Ammonium nitrate N:P (2:1)	932

How to assess whether the pond is correctly fertilized:

Apply the **'elbow test'.** In this test (also called the 25-centimetre test) the hand is dipped into the fish pond up to the elbow.

- If the finger tips are just visible, this indicates good fertilisation and therefore enough natural fish food in the pond.
- If the fingertips are not visible, too much manure has been applied. Further application should be stopped as oxygen levels might be depleted leading to mortalities. Drain some of the water and refill with fresh water to correct.
- Visibility extending beyond the fingertips indicates inadequate fertilisation.



Liming

- Lime is applied in a fish pond to create a neutral pH which is favourable for algae and fish production.
- Lime also controls pests and some diseases by disinfecting the fish pond.
- As a general rule, the application rates of lime should be similar to that of cropping fields around the pond.

Pond pH	Lime requirement (kg/hectare of $CACO_3$)		
	Heavy loams/clays	Sand-loam	Sand
4.0	14.3	7.2	4.5
4.1-4.5	10.7	5.4	4.5
4.6-5.0	9.0	4.5	3.6
5.1-5.5	5.4	3.6	1.8
5.6-6.0	3.6	1.8	0.9
6.1-6.5	1.8	1.8	0

Supplementary feeding

- Improves the growth rates of fish and comprise of vegetable wastes, kitchen wastes, cereal bran, crushed maize, spoiled fruits, slaughterhouse wastes, oilseed cakes, brewery wastes and many on-farm feeds.

Use of commercial feeds

- These are formulated fish feeds and are available from stockfeed stockists in pellet and mash forms. Feeding rates are as per manufacturer's recommendations. Fast growth rates are achieved when using commercial feeds.

Harvesting


- Fish should be harvested after a growing period of at least 8 months depending on the size preferred by the market.
- Harvesting can be continuous using rod and line, traps, nets or complete harvesting after draining the ponds at the end of the growing season.
- Where seine-nets are used the water level is lowered and the net is dragged through the pond. Any fish larger than the mesh size of the net used will be dragged out unless it escapes under or over the net. Desired fish will then be selected before the rest is taken back into the pond.
- Fish that will need to restocked should be handled as gently as possible to reduce any physical damage. Damage to the fish due to poor handling will make them more susceptible to fungal and bacterial infections.
- Complete harvesting is only recommended where there is adequate and affordable water supply to the ponds to refill and to top up other ponds.

Fish storage and preservation



- Depending on the number of fish to be harvested and how they will be used (for sale or direct consumption), fish can be stored alive, fresh, preserved or processed, for later consumption or for sale.
- As soon as a fish dies it starts to decompose, so it has to be gutted it immediately and all internal organs and blood removed.
- Rinse the fish with clean water and place in a cooler box or any desired cooler place and maintain the cold chain up to the market

Fish can be preserved by freezing, cooking, salting, smoking or sun drying.
Drying-removes water from the surface and flesh of prepared fish.
Smoking-removes most of the water in the flesh of fish by exposing it to wood smoke.
Salting- removes most of the water in the flesh of fish and replaces it with salt.
Freezing-Fish is exposed to low/freezing temperatures in refrigerators or cold rooms.

Cage Culture

Cage farming is an excellent water based and more productive method of fish production. It is made up of a floating framework and mesh nets suspend on water. Cages come in different sizes and can be stocked with desired sizes.

Advantages

- Use of existing water body
- No cost of conveying water to production site
- More productive than pond culture per m^2 due to increased stocking
- Cages can be moved from one place to another
- Easy to manage waste
- Good water quality parameters

Disadvantages

- Requires high initial capital
- Highly susceptible to poaching
- High risk of diseases

Biosecurity

These are practices, procedures and policies to prevent introduction and spread of infectious diseases and parasites and disease causing microorganisms (bacteria,viruses,fungi).

Points to consider:

- Secure good robust fingerlings from reputable breedersto prevent entry of pathogens into the stock
- Pathogen management: prevent entry of alien stocks, thereby avoiding cross contamination. Nets and all equipment to be properly washed with disinfectant after harvesting operations
- Residue control: ensuring that all potentially harmful residues are properly disposed of
- People management: controlling movement of people to and from the production site. To make use of wheel and foot baths for both vehicles and people respectively.

Common problems in fish ponds

Problem	Effects	Control
Fungal, bacterial and protozoan diseases and parasites	- Slow growth rates - Mortalities	- Drain water, dry pond and apply lime to disinfect. - Prevent wild fish from getting into pond.
Over-crowding	- Low oxygen levels - Stressed fish prone	- Thin out population to maintain correct stocking rates.

	to disease	
Water contamination or too much manure	- Deoxygenated water - Mortalities	- Flush fish pond with clean fresh water. - Avoid contamination of water by chemicals. - Apply recommended manure application rates.
Predators (birds, otters, crabs, other fish)	- Fish losses	- Eliminate or discourage threats. - Screen water inlets into ponds.

Dam Fisheries

There are more than 10,000 inland dams in the country that can be sustainably managed for fish production.

Some common fish species found in local dams

- Bream *(Tilapia / Oreochromis)*

- Catfish/Barbel *(Clariasgariepinus)*

- Mudsuckers*(Barbus/Labeo)*

- Bottlenose *(Mormyruslongirostas)*

- Bulldog *(Marcusenius)*

- Tigerfish *(Hydrocynusvittatus)*

- Barbus species

Legislation on fishing in dams

- The use of fishing nets is regulated by law. Under the Parks and Wildlife Act (1990) as administered by the Zimbabwe Parks and Wildlife Management Authority (ZPWMA), it is a requirement to have a fishing permit to possess fishing nets.
- Under the Act, netting in rivers is prohibited as these are the breeding grounds of fish.
- Fishing licence application forms can be obtained from localAgricultural Extension Departments.
- After the relevant sections are filled by the prospective fishermen, local Rural District Council andthe local Agricultural Extension Services, the forms should be sent to the Fisheries Unit in Harare (Ministry of Agriculture) for fishing recommendations. From there they are forwarded to ZPWMA for fishing permit approval.
- A dam survey to assess fish population is conducted first to determine if a dam can viably sustain commercial fishing activities. This is carried out by the Fisheries Unit or ZPWMA.
- Fishing licences are renewed annually.

Note:*Fishing with hook and line does not require a fishing licence*

Fishing Gear

- Gill nets are the recommended on the fishing licence. The licence also stipulates the number and the corresponding mesh sizes of nets to be used on a dam
- The nets are set on a dam, left for several hours (or overnight), and then pulled in and the fish caught by the gills removed.

Fishing Boat

- A boat for carrying at least two people is required for fishing with nets.
- Use of life jackets by fishermen at all times is strongly recommended.
- Proper maintenance and repair of all leaks to prevents accidents.

Handling and processing at site

- Removal of the guts and gills and washing the fish with clean good quality water immediately after capture improves the quality of the product. Good hygiene at the site of processing and the use of clean water is important.
- Spoilage is most rapid between 30 and 40 ^{o}C. Keep fish in the shade, out of direct sunlight. Temperature can be reduced by placing a damp sack over the fish. The evaporation of the water in the sack will reduce the temperature of the fish. The sack must be kept wet and clean, and the fish well ventilated.

DONKEYS PRODUCTION

Donkeys *(Ass)*
Scientific name: *Equus asinus*

Economic use

- Draft power- e.g. ploughing, harrowing
- Transport: carting, load carrying
- Riding
- Pets

General information

- Same family with horses and zebras (Equine family).
- Donkeys are suited to arid and semi-arid environments and in Zimbabwe they are mostly concentrated in Matabeleland, Midlands and Masvingo Provinces.
- Donkeys in Zimbabwe are generally 0.9 – 1.20m tall.
- Average weight of donkeys is 142kg.
- Coat colour of donkeys range from white to black. Grey is the most predominant colour.

Definitions

Type	Description
Jack	male donkey
Jenny	female donkey
Gelding	castrated male donkey
Mule	offspring of mating a jack with a mare (female horse)
Foal	offspring less than a year old (if it is male: colt; female: filly)

Advantages of using donkeys

- Donkeys are generally more tolerant to disease than cattle.
- Have a longer working life than cattle and can start work from about 2½-3 years. They can work for most of their lifetime (in some cases >20 years).
- Donkeys can live even up to 50 years if they are looked after well.
- Donkeys survive droughts better than cattle and are generally in better body condition at the start of the cropping season.
- Donkeys are less temperamental and easier to handle than cattle.
- Use of donkeys for draught power can result in greater off-take of beef and milk from cattle.

Breeding

- Breeding Jennies for first time is best at 3 years old.
- Gestation period: 11-14 months.
- Birth to a single foal, twins are rare.
- Weaning age: no more than 9 months.
- Breeding ratio of jacks to jennets: 1 jack: 30 jennets.
- Where jennies have given birth to male foals, stallions should not be allowed near as they may fatally harm the foals.
- Castration can be done surgically or by Burdizzo but should be done by a veterinarian and preferably when ambient temperatures are low (e.g. winter months).
- Castration should be done during the first year of life.

Housing

- Should provide protection from harsh weather conditions and predators.

Management

- Recommended to keep jack and jennet separately.
- Animals are grazed on veld and pasture, and can also make good use of fruit and vegetables.
- In Zimbabwe, body condition falls in the late dry season when forage resources become scarce.
- Although donkeys can tolerate long periods without water, they should have ad libitum access; donkeys can consume between 10 and 25 litres of water per day.
- Do not over-work animals: allow them time to replenish their body energy reserves.
- Allow grazing for at least 12 hours per day. Where practical, donkeys should be let to graze at night. If hay is fed, at least 5kg per donkey per day would be required.
- Feeds containing UREA should not be given as this may result in death.
- Avoid using highly pregnant (3rd trimester) or lactating females for work.
- It is recommended that donkeys are worked for not more than 4 hours a day especially for heavy draught tasks such as ploughing.
- Always use the breast-band harness and hitching equipment for attaching donkeys to implements (NEVER use neck yokes as this is inappropriate and also illegal).

Disease prevention

- Routine deworming or deworming after sampling and analysis for internal parasites.
- Routine foot care.
- Use of well-designed harnesses to prevent wounding.
- Less stressful working practices.

Common health problems of donkeys

- Colic: they suffer from various forms of colic - need veterinary assistance to treat.

- *Babesiosis*: treatment by administration of imizol.Prevention is by control of ticks.
- Worm infections: useantihelmintics.
- African Horse sickness: may need to vaccinate to prevent. Report to veterinary authorities
- Back and leg sores due to bad harnessing.

Even though they have been neglected as an object of scientific inquiry, donkeys are used more frequently than cattle and horses.

CROCODILES PRODUCTION

Common species in Zimbabwe: Nile Crocodile *(Crocodlyusniloticus)*

- Average Nile crocodile is 3.5 metres long.

Economic value

- Skins used in exclusive leather industries
- Meat

Terms used in crocodile farming

Term	Definition
Hatchlings	Baby crocodiles and term may apply up to 1 year of age.
Clutches	Groups of hatchlings from the same nest.
Growers	Animals of about one year old to harvest.
Colony	Group of growers or breeders.
Bulls	Another reference to male breeders.

Breeding

- In the wild, sexual maturity is reached when the total length is 2.9-3.3m for males and 2.4-2.8m for females.This can be achieved from 10 years of age depending on ambient temperature.
- Crocodiles need to maintain a body temperature of approximately 30oC.
- Temperature is between 32-34oC for young ones.
- Temperature can be manipulated to determine sex of the animal during incubation (natural or artificial). If temperature in the nest is below 31.70C, and above 34.50C, the offspring will be female. Males are born when temperature is between 31.70C and 34.50C.
- Nile crocodiles show one breeding season per year and in Zimbabwe, eggs are usually laid in September. Nest is a hole made in the ground.
- Incubation is 90days.
- Caution should be exercised in handling crocodiles as they can be fast, aggressive and dangerous.

Farm Location

- Site must be accessible.
- Site must have a clean supply of water and electricity.
- Close to feed suppliers; processing plants and links to markets.
- Site must be secured and meet local authority requirements.

Husbandry

- Important to sort the young according to sizes.
- Takes about 3years to grow crocodiles to market size.
- Fast growing crocodiles reach market size in approximately 2years.

Housing

Pen construction

- Recommended to have pens with round corners over square ones. Crocodiles frequently choose to pile up against the angle, smothering those on the bottom and sometimes allowing the animals to climb over the fence. With rounded corners the pile cannot grow very high before the crocodiles slide sideways and the heap collapses.
- Roof the entire pen with wire netting or criss-crossed strands of wire for small crocodiles. Protect against predators e.g. fish eagle preys on young crocodiles.

Pools

- To be at least 60cm deep otherwise water becomes too hot in summer.
- Pools to be sloped downwards.
- Strip of land 4m wide between the pool's edge and boundary fence.

- Since crocodiles have burrowing capabilities, fences must be buried at least 1m deep to intercept the burrows and prevent predators from burrowing in.

Population density

- 25 crocodiles per unit is the maximum manageable.
- Units should be spaced 8m apart.
- Allow for a separate pen for the sick, injured and weaker animals.

Feeding and Nutrition

- Crocodiles can be fed with chickens and /or discarded meat; fish; beef, crocodile, and horse offal; pellet feed made from manufactured ingredients such as carcass meal, meat meal, fish meal, etc or combination of the above.
- In hot summer months' animals will devour a full meal every 24hours, but feeding rate slackens with the onset of colder weather.
- Young crocodiles will refuse food when the air or water temperature falls below 15.6oC.

Killing, Skinning and Tanning

- Use a humane way: catch with a noose and sever the spinal cord just behind the skull.
- A single hole resulting from a slip of the skinning knife may reduce a hide's value by 25%.
- After skinning, hides are coated with about 0.5cm of coarse salt and rolled up.
- Pre-tanned hide is called a crust.

Diseases and parasites

- *Trichinella spp*
- *Salmonella*
- Roundworm (nematode)-this burrows into the belly skin, ruining the hide. There is no treatment or control.

Marketing and Processing

- 80% of income is from skins; 20% is from meat.
- For skins: first grade skins are very valuable; second grade skins are worth about 74% of first grades and third grades worth about 50% of first grades.

APPENDIX

Stockfeed Analysis

(Source Sheep handbook)

DM	= dry matter	Ca	= calcium
CP	= crude protein	P	= phosphates
DP	= digestible protein	Fe	= iron
TDN	= total digestible nutrients	Mn	= manganese
CF	= crude fibre	Zn	= Zinc

The following are examples of commonly used feeds

Cereals and other energy concentrates

Feed	DM%	CP%	DP%	TDN%	CF%	Ca%	P%	Vit. A IU/g
Buss (from mhunga/nyauthi)	91	11.9	6.6	60	6.6	-	-	-
Corn and cob meal	88	7,6	3.9	73	5.5	-	0,35	-
Maize grain	88	8,0	6.5	80	2.1	-	0.40	-
Maize bran	90	7.0	4.0	68	13.3	0.03	0,50	-
Maize germ	90	10.0	7.5	87	42	0.04	0,50	-
Masese	93	11,9	8.5	62	8.9	-	-	-
Molasses	75	3.2	0.0	54	6.0	0,89	0.08	-
Munga/Nyauthi (millet)	92	10.5	7,6	80	1.7	0.05	0.40	-
Rapoko	88	7,2	3,8	82	3.2	-	-	-
Snapcorn (corn, cob & husk)	88	7.5	4.8	77	20.3	-	0.20	-
Sorghum grain	90	‘0.0	8.1	79	2.3	0.04	0,30	-
Sugar cane	90	-	-	97	-	-	-	-
Wheat grain	89	12.7	10.0	78	1.5	0.05	0.36	-
Wheat bran	90	14.0	9.5	65	8.9	0.10	1.10	1.0
Wheat pollard	90	‘6.0	12.0	76	12.2	0.10	1.00	1.0

Legumeseeds and oilseeds

Feed	DM%	CP%	DP%	TDN%	CF%	Ca%	P%	Vit. A IU/g
Cowpeas	89	27.4	19.2	76	5.4	0,10	0.46	-
Cottonseed (whole)	92	22.2	6.4	88	21,3	0,14	0,68	-
Groundnuts (kernels)	94	30.0	27,6	138	2,4	0,06	0.44	-
Groundnuts (in pods)	94	24,9	20,2	103	22,0	-	0,33	-
Jack bean	90	24,7	20,7	82	4,0	-	-	-
Jack bean	90	—	13,0	72	35,0	-	-	-

and pod meal								
Soyabean seed	91	39,8	35.4	84	5,0	0,25	0,59	1.4
Sunflower seed (kernels)	95	27,7	25,2	116	6.3	0,20	0,96	-
Sunflower seed (wish hulls)	94	‘4,0	19,1	71	24,0	0,17	0,52	-
Sunflower head (entire)	93	8,9	3.7	60	-	-	-	-
Velvet beans	90	23,4	19,0	82	4,0	-	-	-
Velvet beans in pods	90	18.1	13,4	74	35.0	0,24	0,38	-

Oil seed cakes and meals

Feed	DM%	CP%	DP%	TDN%	CF%	Ca%	P%	Vit. A IU/g
Cottonseed cake I	93	41,3	32,8	72	10.7	0.20	1,20	0,3
Cottonseed cake II	92	36,0	28,1	72	14,4	0,20	0,20	0,3
Groundnut cake I	94	46,7	42,4	85	5,0	0,16	0,80	0.3
Groundnut cake II	93	52,0	46,7	85	5,0	0.86	0.80	0,3
Soyabean meal (expressed.)	90	43,8	39,4	85	5,2	0,25	0,60	0,3
Soyabean meal (solvent extracted.)	89	45,8	41,3	71	5,2	0.32	0,67	-
Sunflower cake	94	50.7	46.2	72	5,4	0,26	1.22	-

Dry roughages

Feed	DM%	CP%	DP%	TDN%	CF%	Ca%	P%	Vit. A IU/g
Cottonseed hulls	90	3.9	0,4	51	45,0	0,14	0,09	-
Cowpea hay	91	18,3	12,0	52	25,!	1,21	0,25	-
Cowpea straw (seed harvested)	92	6,8	2.0	38	44,5	-	-	-
Dolichos hay	90	14,8	9,6	51	24,0	0,87	0,26	-
Groundnut hay (tops)	93	9,6	5,0	48	3	t,12	0,13	-

Groundnut shells	94	4,9	1.2	19	60.4	025	0.06	-
Lucerne - early cut	93	18,5	13,0	52	23.7	1,22	0.33	74,5
Lucerne - good average	91	14,t	10,2	50	30.2	1,20	0.22	30,0
Lucerne - mature, stemmy	93	9,2	4,7	43	36,0	0,82	0,13	12,0
Maize, cobs	90	2,5	0,6	44	32,1	0,11	0,04	1,0
Maize, leaves	83	7,7	3.5	50	23.9	0,57	0.21	-
Maize, sheath (husk)	85	3,4	0,4	40	28,2	0,	0.12	-
Maize, stalk	83	4,7	0,8	41	28.0	0,32	0,23	-
Maize, stover	87-	5,1	2.7	54	35.4	0,43	0,08	-
Maize - (dust)	90	9,2	5,6	78	7,8	-	-	-
Rhodes grass (Giant) hay	91	8,3	8,7	51	32,0	-	-	53.0
Soyabean hay	93	t4,3	9,6	49	28,1	1,10	0.22	-
Soyabeanstraw	88	4,8	1,4	38	41,2	1,39	0,05	-
Velvet bean hay	90	12,5	7,3	49	23,3	-	0,24	-
Veld hay	90	2,0	0,5	45	45,0	-	-	-
Sugarcanebaggase	92	1,2		21	47,0	-	-	-

Green roughage and succulents

Feed	DM%	CP%	DP%	TDN%	CF%	Ca%	P%	Vit. A IU/g
Clover (Ladino- *T. repens*)	17	4,1	3,3	12	2,5	0,21	0,07	92
Kale - marrow stem	14	2,2	1,8	10	2,2	-	-	-
Lucerne-immature	21	4.3	3,4	13	5	0,48	0,06	103
Lucerne-in bloom	25	4,3	3,2	14	7,0	0,39	0,07	90
Napier fodder	IS	1,6	1,0	8	-	0,09	0,06	-
Oats (before heading)	14	3.2	2,4	9	2,8	0,06	0,09	100
Oats (headed out)	27	2,5	1,8	17	7,8	0.09	0,09	100
Paspalum - Paraguay	20	1,6	0,6	81	-	-	-	-
Paspalum - wintergreen	20	2,0	0,8	8	0,5	-	-	-
Potato tubers	24	2,2	1.4	21	2,5	0,01	0.05	-
Pumpkins	10	1.7	1.3	9	1.6	-	0,04	-
Rapoko grass	20	2,1	1,0	1	6,0	-	-	-

(*Eleusine*)								
Star grass (Maguga)	20	2,0	0,9	11	6,0	-	0.10	-
Sudan grass	23	2,0	1,4	14	8,0	0,12	0,07	80
Sugar cane tops	26	1,3	0,6	13	8,4	0.09	0,05	-
Veld grass - immature	32	3,5	2,3	21	10,0	0,20	0,08	115
Veld grass – mature	71	3,2	0,8	49	35,0	0,28	0,04	-

Silages

Feed	DM%	CP%	DP%	TDN%	CF%	Ca%	P%	Vit. A IU/g
Citrus pulp	20	1,4	0.4	17	3,5	0.40	0,03	-
Maize, good, high DM	40	3,2	1,8	28	8,0	0,11	0,08	-
Maize, average quality	28	2,3	1.3	19	6,5	0,08	0,06	-
Maize, poor quality	27	2,0	0,7	85	7,0	0.10	0,05	-
Maize, and legume	26	2,6	1,8	19	7.0	028	0.12	-
Sunflower	23	2.1	1,6	12	3,0	0,39	0,04	-
Sweet sorghum	26	1,6	0.4	15	8,0	0,09	0,05	-

Mineral Supplements (Macro-Elements)

Supplement	Ca %	P%	Fe%	Mn (mg/kg)	Salt %	Zn (mg/kg)
Di-calcium phosphate	22.00	18.00	-	700	-	-
Mono-calcium phosphate	16.00	20.00	-	-	-	-
Monosodium Phosphate	-	22.00	-	-	-	-
Limestone flour	37.00	0,04	-	600	0.10	-

Fattening Concentrate

Feed	Crude protein %	Urea %	Estimated DP %	Ca %	P %	Approximate TDN
10% urea 1:9	64	10.0	49.4	2,3	1.3	56.0

20% urea 1:9	64,0	20.0	44.2	2,8	1.2	-
12% urea 1:6	42,0	12.0	28,6	-	-	-
Molasses based with urea: 1: 1 1:6	18,5 44.5	4,0 14.0	11.6 28,9	-	-	-
Ad-lib meal	12.5	2.0	5,1	-	-	-
75% C.P. Conc.	75.0	22.0	51,7	-	-	-
Henderson "Home brew"	47.8	20.0	19.84	-	-	52.0

Specialised Veld Feeding

Feed	Crude protein %	Urea %	Estimated DP %	Ca %	P %	Approximate TDN
40% CP Conc.	40,0	-	33.0	3,1	2,6	-
12,5% Conc.	12.5	1,0	7.7	0,7	0,5	65,0
21% CP. Cubes	2	1,5	15.0	1,3	0.9	-
16% CP. Cubes	6.0	1,0	10.8	1,4	0.9	72,0
Ad lib (urea free)	12.0	Nil	7,8	-	-	65,0
3% urea	16,5	3.0	10.1	-	-	-
3% urea	12,7 .	3,0	6,9	-	-	-
Summer block	8,0	2.0	3,0	-	-	-

Winter Maintenance

Feed	Crude protein %	Urea %	Estimated DP %	Ca %	P %	Approximate TDN
50% CP. Cubes	50.0	5.0	39,4	0.5	1.3	75.0
.30% CP. Cubes	30.0	4.0	21,9	0.4	0.7	67,0
Weaner Cubes	37,0	2.3	28.8	2.6	1.1	69.0
40% CP block	40,0	3.5	31,2	-	-	-

35% CE block	35.0	6.0	23.4	-	-	-
30% CE block	30.0	3,0	22.4	0.3	0,7	-
'Agritex' block	30,3	8,0	20,1	0.8	1,1	-
'Lourea' (liquid)	19,6	7,0	14,0 – with 65% molasses			-.

Miscellaneous Feeds And Blocks

Feed	Crude protein %	Urea %	Estimated DP %	Ca %	P %	Approximate TDN
Mineral block	-	-	-	4.0	5,0	-
Mineral mix	-	-	-	9.0	10,0	-
5% Phosphorous block/lick	-	-	-	-	5,0	-
10% Phosphorous block/lick	-	-	-	-	10.0	-
Groundnut meal 45%	45,0	-	37,5	-	-	-
Sunflower seed meal 3391,	33.0	-	26.7	-	-	-
Cottonseed meal 40%	40.0	-	33,0	-	-	-
Soyabean meal 47%	47,0	-	39.3	-	-	-
Salt	-	-	-	-	-	-
Mono calcium phosphate	-	-	-	-	16.0	20.0
Urea 46% N	280.0	100,0	-	-	-	-
Molasses	-	-	-	-	0.89	0.08
*Vitamin A per 70 million I.U.	-	-	-	-	-	-
Limestoneflour	-	-	-	-	37.0	0.04

**The amount of Vitamin A to mix with 1 tonne of 20% urea concentrates for high energy feeding.*

D-Grade Maize

The average proportion of diseased grain in D grade maize ranges from 20,01 23.9 percent with average 22.1%.

Beef cattle

Maize fraction of any ration to contain no more than 25 percent diseased grain.

Dairy cattle

Dairy rations should not contain more than 11 - 13 percent diseased grain, e.g. mixture 60 percent A grade to 40 percent D grade maize will give a product containing 11,44 percent diseased grain.

Pigs

Not more than 30 percent D grade (i.e. 6 percent diseased grain*) in rations for pigs.

Note: With farmers intend on using D grade maize in animal rations, they should make a thorough examination of the maize to ensure that the diseased grain content is less than 22 percent.

Calculation of percentage of digestible protein

Cost per kilogram of digestible protein and crude protein is calculated as follows:

Cost of feed in cents per tonne
10 x % DP [or % CP]

The same method can be used to calculate transport costs, e.g.

Cost of transport per tonne in cents
10 x DP [or %CP]

Calculation of percentage digestible protein

Calculation of this figure is based on the crude protein value provided by the manufacturer, using the formula: DP = (CP x 0,9) - 3

Where urea is included in the feed, calculation of the digestible protein is as follows:
DP = CP - (% Urea x 2,87) x (0,9-3) + (% urea x 2)

Urea utilization is assumed to be 200 percent efficient in supplementary feeds. This, however, will vary according to the amount of natural protein and energy in the total diet.

Optimum urea utilization will occur if the following nutritional factors are adhered to:

i) Source of energy (ideally where starch is readily available)
ii) Urea does not replace more than one third of the total protein consumed
iii) The natural protein level of the diet is low (12% or less)
iv) Small amounts of urea are consumed frequently
v) An adjustment period is provided for urea-containing ration
vi) Sufficient minerals are supplied.

Maize Silage

Silage making involves all operations from cutting immature maize on the land through to loading it into the silage pits.

Assumptions

Summary of labour and fuel inputs for silage production

Method of Production	Labour days per tonne	Fuel litres per tonne
Forage harvester (D+1)	1.64	0.16
By hand (D+10)	0.46	0.39

- (D +1) Driver and one general worker
- Note: 10 percent may be added to above figures for contingencies

Physical inputs required for silage making when using forage harvester

Silage yield	15 t	20 t	30 t	40 t	50 t	60 t	70 t	80 t
Equivalent yield of grain (kg/ha)	1920	2560	3850	5130	6410	7690	8970	10250
Approximate yield in bags/ha	21	28	42	56	70	84	98	112
Fuel inputs (litres)	25	33	50	66	83	99	116	132
Labour inputs: drivers labour days	1.5	2.0	3.0	4.0	5.0	6.0	7.0	8.0

Silage making: physical inputs using hand labour

Silage yield	15 t	20 t	30 t	40 t	50 t	60 t	70 t	80 t
Equivalent yield of grain (kg/ha)	1920	2560	3850	5130	6410	7690	8970	10250
Approximate yield in bags/ha	21	28	42	56	70	84	98	112
Fuel inputs (litres)	6	8	12	16	20	24	28	32
Labour inputs: drivers labour days	0.75	1.00	1.50	2.00	2.50	3.00	3.50	4.00
Labourers (labour days)	6.15	8.20	12.30	16.40	20.50	24.60	28.70	32.80

The approximate mass of silage (t) per metre depth in relation to the end section of pit silos.

Diameter (m)	*Mass (tonnes)	Mass in 5 cm layer (kg)
4	7.0	350
5	12.0	600
6	17.0	850
7	23.0	1 150
8	30.0	11 500

*Rounded to nearest tonne or 50kg

Note: A cubic metre of silage weighs approximately 600 kg

The approximate mass of silage per metre of length in relation to the end of either trench or bunker silos

Width and height (m)	*Mass (tonnes)	Mass in 5 cm layer (kg)
4 x 2.5	*6.0	*300
5 x 2.5	7.5	375
6 x 3.0	11.0	550
7 x 3.5	16.0	800
8 x 4.0	20.0	1 000

**Rounded figures to nearest tonne or 50kg*

Maize Stover

Average maize stover composition (%)

Dry matter	Total digestible nutrients	Crude protein	Digestible protein	ME Value (MJ/kg)
90.5	52.0	5.8	0.6	8.6

Stover consists of dry leaves and stalks of the maize plant after the ears have been harvested. It is low quality roughage but it has considerable value when properly used. Good quality stover comprises nearly one half of the dry matter and about a quarter of the digestible protein of the entire maize crop.

Maize stover is palatable and useful, particularly to breeding stock, during the dry season. It may be used for dry dairy cows, but it should form only a small part of the ration for high producing dairy animals.

If harvested and milled, with no additions, stover can be used to substitute maize silage. In a ration for dairy cattle, one tonne of stover has dry matter content equivalent to 3,1 tonnes of maize silage, but the former will be 9 percent lower in total digestible nutrients (TDN) and 20 percent lower in crude fibre (CF). It may be offered with urea and molasses which will increase the diet's non-protein nitrogen content, digestibility and nutritive value as well as its palatability.

Stover is normally grazed *in situ* by beef cattle: the expense of cutting, carrying and milling only justified when fed as a survival ration during a severe drought. It will be more fully utilized when both the stalk and leaf are consumed. If grazed *in situ*, however, only the latter is taken and most of the stalk is left on the ground.

Stover yield is equal in mass to stover yield;i.e. five tons maize grain will also give five tons maize stover. The carrying capacity of this yield of stover when grazed *in situ* is approximately 250 cattle days per hectare.

Other stover

- *Sorghum stover* has a similar composition to maize stover, and provides useful dry season grazing when available. However, care must be taken that the livestock do not graze wilted or frosted re-growths as prussic acid poisoning can occur.

- Soya bean stover is very poor quality roughage, as most of the leaf is shed by the time stock graze it and is normally only utilized during drought.

Pastures

Leys
These are important, especially in sandveld areas where they form part of crop rotation.

Varieties and Seeding rates
Suitable grass varieties will depend upon the crops grown, class of arable land and the agro-ecological zone.

Tobacco rotations
Lovegrass: 1,1 - 2,3 kg/ha
Sabi panicum: 7 - 9kg/ha
Katambora Rhodes: 7- 9kg/ha

Rotation with maize or other eelworm-tolerant crops
Giant Rhodes: 7 - 9kg
In vleis: *Panicum repens*. Nile grass: *Paspalum urvillei*
Middleveld: *Cenchrus spp*

Management and Utilization
Include as a paddock in the normal grazing rotation. Carrying capacity approximately 1LU:1,2ha. Mostly cut as hay.

Dryland Fertilized Pastures
- Not recommended in areas having less than 750mm annual rainfall:
- Vleis can be used to offset some or any rainfall deficiency;
Fertilizer dressing:
Single super phosphate: 450 kg/ha
Ammonium nitrate: 900 kg/ha
- Stocking rate 5LU per hectare
- Rotation should provide for about three weeks rest after nitrogenous fertilization to avoid toxic nitrate levels in grass.
- Mid-season drought: plan for adequate reserves.

Irrigated pastures
The profitability and success of these is largely dependent upon the management ability of the farmer and the availability of cheap irrigation.

Varieties

Type of grass	Characteristics
Star grass	Proves to be the best. Kikuyu has proved satisfactory. Torpedo grass (*P. repens*) is suitable for vleis
The paspalums:	Vasey (*P. urvillei*), Dallis (*D. dilatatum*), Paraguay takes longer to establish, but is worth considering.
Midmar Rye Grass	Normally irrigated - More productive during the cold months of the dry season than common Italian rye grass. - Has been found to be resistant to rust, but rotate the cropping land. - Very palatable and highly digestible

Feed Value And Possible Yields

	Yield (kg)	% Dry Matter	% Crude Protein	% Total Digestible nutrients
Rye grass (wet)	58 300	24	4.4	16
Ryegrass(dry)	14 000	100	18.0	67

At establishment requirements are:
- 500 kg compound C
- 1000 kg/ha lime
- 700 kg/ha single super phosphate (will vary according to soil type)
- 200 kg/ha ammonium nitrate should be applied after each cut.
- seedling rate: 30 – 50 kg/ha

Utilization: cut and carry or graze; provides fodder mostly in winter.

Fertilizer required for irrigated pastures (kg/ha)

Time	Requirements
August:	450kg dolomitic limestone (Mg) 450kg single super phosphate 28 kg zinc sulphate 10kg fertilizer borate
Late August to December	1100 kg Ammonium nitrate in five dressings applied immediately after grazing
December to April	Up to 550kg ammonium nitrate depending upon the season.

Irrigation

Start in mid-August after lime and phosphate application.

Time	Requirements
August	50-100 mm
September	35 mm per seven days
October	40 mm per seven days (or 60 mm per 10 days)

Stocking Rate

Approximately 10 LUs pa hectare

Management

- Do not over-rest: grass grows top rank
- Do not overgraze: any pasture grazed too short takes time to recover and retain its maximum growth rate
- Rotate either with 10 paddocks: graze two days and rest 18 days, or with 20 paddocks: graze one day and rest 19 days. Alternatively, strip-grazing may be practised using an electric fence.
- Graze, fertilize, and irrigate: avoid irrigating just prior to grazing.

N.B: *Higher seeding rate is necessary where no scarification was done.*

The pasture varieties, rainfall requirements, altitude, soil type.

Common Name	**Intortum**	**Beit Lotononis**	**Archer**	**Cooper Glycine**	**Kenya White clover**
Scientific	*Desmodiumintortum*	Lotononisbainesii	*Macrotyloma axillare*	*Neonotoniawightii*	*Trifolium semipisolum*
Altitude	1 300+ m	1 200 + m	1 500 + m	1 500 + m	Dryland, Eastern Highlands
Rainfall	900 mm+	750 mm+	750 mm+	750 mm+	Irrigated or vleis
Frost resistance	Fairly tolerant	Tolerant	Fairly tolerant	Fairly tolerant	Very tolerant
Fire resistance	Fairly good	Good	Good	Good	Not known
Soil type	Wide range	Best on sands	Well drained soils	Pastures	Irrigated pastures/ vleis
No. of seed/gram	760	3 300	120	140	1 300
Pre-sowing treatment	Not necessary	Mechanical scarification	Acid – 5 minutes	Acid – 20 minutes	Acid – 20 minutes
Inoculation	Desirable on sandy soils	Very specific	Not necessary	Not necessary	Very specific

Fodder Trees

- Fodder trees are very essential in the diet of goats.
- Ideal trees .and shrubs include.
  - Acacia
  - Sesbania
  - Leucaena
  - Mulberry
  - Moringa

- Spineless Cactus

Legal Responsibilities of Stock Owners

Legal responsibilities of stock owners in terms of the ***'Animal Health Act (Cap 19:01) and Stock Trespass Act (Cap 19:04)'***

a. Legislation on several species

1. Animal Health (General) Regulations, 1976	i) Report to the nearest authorized person or other owners suspicion of a specified disease ii) Report the death of an animal iii) Isolate a dead or sick animal iv) Submit smears, blood, milk, etc from the animal v) Brand or mark an animal suffering from a disease when required. vi) Report animals straying from outside the country.
2. Animal Health (Anthrax) Regulations, 1971	i) Obtain a permit before moving animals or an animal product from an anthrax area. ii) Report immediately an animal that dies in an anthrax area iii) If no post mortem is done; -take a blood smear from the ear -burn the carcass thoroughly or bury it -disinfect the site with slaked lime iv) Vaccinate an animal in an anthrax area once a year for 3 years v) Produce animals as and when required by an authorized person.
3 Animal Health (Rabies) Regulation 1966	i) Isolate and immediately report the animal suspected to have dies of rabies ii) Isolate, confine and report suspected rabid animals or contacts, destroy the animal without damaging the brain iii) Avoid burying a suspected rabid animal without authority iv) Secure all dogs in a rabies area vi) Cause dogs to be vaccinated at 3 months, 12 months of age and every 3 years.
4. Animal Health (Stock Register) Regulations, 1970	i) Keep a stock register and enter within 14 days, the number of animals owned moved onto / off the farm and farm of origin and destination. ii) Indicate numbers/date when animals were dipped iii) Indicate the reasons for additions, removals and dates. iv) Indicate the number of births and deaths of animals.
5. Animal Health (Quarantine Areas) Regulations, 1976	i) Do not move. Permit movement of an animal or animal product into or from a quarantine area or from one place to another within a quarantine area ii) Produce animals for inspection at the time and place specified in the notice iii) Give all necessary assistance and provide adequate facilities to enable inspections.
6. Animal Health (fees) Regulations,1973	i) Pay fees for services as determined by the department, e.g. quarantine, detention, dipping, vaccination etc.
7. Animal Health (Trypanosomlasis) Regulations, 1971	i) Not move an animal into or from a Trypanosomiasis area or from one place to another within a Typanosomiasis area

	ii) Produce animals for inspection at the time and place specified in the notice iii) Give all necessary assistance and proved adequate facilities to enable inspection

b. Legislations for Cattle

1. Animal Health (Theileriosis) Regulations 1976	i) Not permit an animal to stray into or from a Theileriosis area ii) Produce all animals for purposes of inspection as required by an authorized person. iii) Dip or spray at intervals not more than 7 days at a property under quarantine.
2. Animal Health (Cattle cleansing) Regulation, 1993	i) Not permit cattle to be tick – infested ii) Dip tick-infested cattle at regular intervals of not more than 7 days iii) Not move cattle from one place to or through another place unless they are tick –free iv) Not send or slaughter any cattle dipped until after the elapse of withdrawalperiod. v) Produce cattle for the purpose of counting, dipping and inspections required by an authorized person. vi) not produce for sale by public auction any cattle not tick-free
3. Animal Health (Brucellosis) Regulations, 1995	i) Vaccinate all dairy heifers between 3 -6 months of age ii) Produce satisfactory proof that the heifer or cow has been vaccinated
4. Animal Health (Contagious Vaginitis and Epididymitis) Regulations, 1976	i) Produce animals for inspections at a time and place specified in a notice.
5. Animal Health (Enzootic Bovine Leukosis) Regulations, 1991	i) Produce all dairy animals for purposes of testing upon being required to do so by an authorized person ii) Bran, isolate or slaughter any dairy animal testing positive as instructed by an authorized person. iii) Ensure testing of every dairy animal owned by him/her not less 3 months after the last positive anima has been disposed of iv) Not remove positive animals from his properly except for direct slaughter v) Not introduce untested or positive animals into a free herd.

c. Legislation for Pigs

1. Animal Health (African Swine fever) Regulations, 1994	i) Not move pigs or pork products into or from an African Swine Fever are; into or from an infected area or from any one place to another within an African Swine Fever area. ii) Keep a pig in a fenced sty, pen or run so constructed to prevent it from escaping

d. Legislation for Poultry

1.Animal Health (Poultry) Regulations, 1976	i) Not sell poultry for breeding or hatching eggs unless in possession of a valid certificate ii) Not move poultry or infectious thin into, within or from a Paratyphoid area iii) To produce poultry when required for the purposes of inspection or testing by an authorized person.
2. Animal Health (Poultry Paratyphoid)Regulations 1966	i) Not move poultry or infectious thin into, within or from a Paratyphoid area ii) To produce poultry when required for the purposes of inspection or testing by an authorized person
3. Animal Health (Newcastle Disease) (Control) Regulations, 1999	i) Not move poultry or hatching eggs into, from or through Newcastle disease infected or quarantine area ii) Vaccinate with an approved vaccine poultry within a Newcastle disease infected area iii) Produce poultry as required by an authorized person for inspection or vaccination

e. Legislation on Animal Movement

1. Animal health (Movement of Cattle and Pigs) Regulations, 1984	i) Not move cattle or pigs from one place to another without a permit ii) Proved a separate permit for each consignment iii) Not move cattle or pigs owing to a diseases outbreak despite having obtained a permit iv) Provide accurate information required when applying for a permit v) Produce the relevant permit when required to do so
2. Animal Health (Movement of Game Animals) Regulations 1984	i) Not move game animals from one area to another without a permit ii) Provide accurate information required when applying for a permit iii) Apply in writing for a special permit to the Director of Veterinary. iv) Services for movement of Buffalo, Bush pig, Warthog and Wildebeest
3. Animal Health (Game Carcass) Regulations 1966	i) Not move game meat from a prescribed area unless it has been inspected by an authorized person and stamped ii) Not remove any hides or skins of game animals unless they have been salted anddried for at least 7 days iii) Not remove any horns, hoofs, bones, teeth or tusks of a game animal unless they have been exposed to direct sunlight for not less than 14 days iv) Keep the game meat in approved cold room within the prescribed area until it has been inspected. v) Ensure that the head, tongue and all four feet remain on the carcass until it has been inspected.

	vi) Keep a register for inspections and record details within 7 days of slaughter
4. Animal Health (Foot and Mouth Diseases) Regulations; 1971	i) Not to move an infectious thing into or from a foot and mouth disease area, into or from an infected area or from any one place to another without a permit (infectious thing – animal products, animal feed, etc) ii) Produce animals for inspection and vaccination at the time and place specified in a notice.
5. Animal Health (Vehicle Sanitation) Regulations 1986	i) Ensure that the vehicle used for transporting animals for slaughter is adequately sanitized.

f. Legislation on Other Livestock Issues

1. Animal Health (Branding of Cattle) Regulations 1985	ii) Brand/tag cattle over 6 months of age or more with an appropriate veterinary tag or brand on the left side off the neck or shoulder iii) Produce cattle for branding. Tagging and inspection as required by an authorized person iv) Not move cattle from one prescribed area to another unless they are branded with a numeral brand
2. Animal Health (Artificial Insemination) Regulations, 1978	i) Not distribute semen for insemination of cows or pigs unless registered ii) Not inseminate any other animals that do not belong to the inseminator. Recipient iii) Keep record of animals inseminated

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